# THE ACTION OF BENZOATE OF SODIUM ON URIC ACID EXCRETION AND METABOLISM.

T H E S I S

presented for the degree of M.D.

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The reason why these experiments were undertaken.

The following is a record of a series of experiments which were undertaken with a view of determining the effect of benzoate of soda on uric acid excretion, and is presented as a thesis for the Degree of M.D.

The method of carrying out the investigation.

Several patients who were suffering from no organic lesions were placed at my disposal in the Royal Infirmary. Their urine was collected for twenty-four hours and tested in the same manner and process as in the following test cases, with a double or check test of each urine. These patients were under the ordinary diet of the Royal Infirmary, and were taking no medicine, only a little tinct. card. co.

After /

After I had become thoroughly familiar with the process so as to reduce the sources of error to a minimum, I proceeded to the test cases by the following process.

The urine was collected for twenty-four hours, and the quantity, specific gravity, and reaction noted.

A standard solution of permanganate of potassium was then prepared by the following method. 1·578 grammes of permanganate of potassium was taken to each litre of distilled water, tested by means of a solution of uric acid of ·05 grammes to 100 c.c. distilled water, and a few drops of caustic soda was added to dissolve the uric acid. It was next boiled and allowed to cool, and 20 c.c. of strong sulphuric acid added. Titrated against the standard solution, which in this instance took 13·5 c.c. to produce permanent reaction of a pale pink colour, gave the corrected figure for the standard solution. The amount per cent. of uric acid was estimated by noting the amount of standard solution of permanganate of potassium taken to reduce the uric acid and then by noting the effect of the administration of benzoate of soda on the metabolism.

The benzoate of soda was then intermitted for two days and after that I varied the length of the experiment by continuing the benzoate of soda for four days, and then made an intermission for four days; this ratio I continued until the end of the experiment.

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I thus satisfied myself regarding the amount of uric acid per cent. and per diem in relation to the amount of urine in the twenty-four hours.

By some authors it is stated that the administration of benzoate of sodium produced the formation of sugar. This was daily tested for in the usual way by means of Fehling's solution.

The amount of free nitrogen present was estimated by means of Kjedahl's method.

The Kjedahl's process is briefly as follows. The distillation apparatus is first made ammonia free by Wanklyn's process, testing each 50 c.c. of water distilled over by Nessler's solution, until the tint of distillate is got to match the distilled water in Nessler's cylinder.

The urine of twenty-four hours is thoroughly mixed, and 5 c.c. of it is placed in a Kjedahl's flask, the last drop is carefully squeezed out by means of the right fore finger being put over the opening in the top of the pipette and the left hand round the bulbed portion of the pipette, the heat of the left hand expanding the air in the pipette and driving out the /

the last drop. The end of the pipette being previously dried, in this way 5 c.c. of urine was accurately got.

A piece of metallic mercury the size of a pea is then dropped into the urine, and 20 c.c. of nitrogen free sulphuric acid added; the sulphuric acid is never absolutely nitrogen free, and this was allowed for in standardising the standard solution. The flask is then placed on the Bunsen burner in the fume chamber for about half-an-hour till it is quite clear. Here a chemical action takes place; sulphurous acid, carbonic acid, and water passes up the chimney, leaving sulphate of ammonia.

This method, by adding the metallic mercury, is a rapid one. There is another and slower method, by heating until the solution is the colour of pale sherry, then allowing it to cool, and adding a pinch of permanganate of potassium on the point of a pocket knife to the Kjedahl's flask. By heating for about half-an-hour, the same clear colour and change takes place as by adding metallic mercury. This method, however, takes six hours as against from a half to three-quarters of an hour by the metallic mercury.

The flask is then put on the sand bath to cool. The /

The solution is cautiously diluted with water, and gently shaken until the precipitate is dissolved. To the reciving flask 40 c.c. of decinormal $\frac{N}{10}$ sulphuric acid is added. All the flasks and apparatus must be made thoroughly clean by means of nitric or hydrocloric acid, next washed out five or six times with tap water until acid free, then by distilled water, and, if to be used for solutions, rinsed out by the solution to be used. The distillation tube is fixed to the Kjedahl's apparatus, only allowing the tube to touch the surface of the sulphuric acid. In order to let the rubber tube slip easily over the metal pipe of the Kjedahl's condenser, the inner surface of the rubber tube is wetted with distilled water and slipped on with a rotary motion.

A few small pieces of ordinary clay pipe crushed down are then put into the distillation flask to prevent bumping, and there is added to the distillation flask the contents of the combustion flask. The combustion flask is washed with some distilled water into the distillation flask, and 250 c.c. of caustic soda is added to the distillation flask.

The outside of the distillation flask is thoroughly dried to prevent it breaking from rapid condensation of /

of the water on its surface. About 50 c.c. of potassium sulphurate is added to the thistle funnel, and the distillation flask is shaken to mix the contents thoroughly until a dark brown colour is got. The water tap is turned on about half cock to run water through the condenser to keep it cool. This point must be carefully borne in mind; it is occasionally forgotten, and the apparatus gets heated and breaks. The flame is now applied, allowing the ammonia to distil over into the receiving flask, and it is caught in the receiving flask and fixed there as ammonia sulphate. The distillation process must have undivided attention, and on the first sign of bumping over the flame is lowered, or the flame is removed for a moment. Bumping is apt to occur if too much water is added to the distillation flask.

The flame being turned out, the receiving flask is removed, and its contents poured into a large porcelain basin. A few drops of cochineal is added, just sufficient to give the solution a very faint pink tint, or litmus blue may be used. Phenol-phthalein can be used as an indicator in any case except when ammonia is present.

It is titrated against decinormal $\frac{N}{10}$, caustic soda is which gradually /

gradually dropped in from the burette until the neutral point is reached, then from the burette can be read off how much caustic soda has been used, and a calculation made.

Example :

40 c.c. sulphuric acid in receiving flask.
15·5 c. c. $\frac{N}{10}$ caustic soda required to neutralise the above.
24·5 c.c.

The 24·5 c.c. is not neutralised by the soda, consequently it has been neutralised by the ammonia which has been distilled over.

24·5 multiplied by 1·4 brings it to nitrogen, a fixed factor.

24·5 c.c.
1·4
980
2450
33·30 milligrammes of nitrogen obtained by multiplying ammonia by 1·4 to bring it to nitrogen. The decimal point put forward three points brings it to grammes.

·0333 /

·0333
·0004

·0329 nitrogen is obtained by deducting ·0004,--that is the nitrogen contained in the 20 c.c. strong sulphuric acid in the combustion flask. Multiplied by 20 to get percentage of 5 c.c. of urine used,--

·0329
20

·6580 in 100 c.c.,--i.e., ·658% nitrogen.

This example is experiment No. 2, James Brown; date of sample of urine, 23rd December 1904, (see table of results of the above date.

The following method was used in making the standard solution of permanganate of potassium for the experiments. The measure was thoroughly cleaned and dried in order not to dilute the acid. To make a decinormal solution, the normal solution of sulphuric acid was taken and diluted ten times and made up with distilled water to 2000 c.c. Then 30 c.c. of decinormal caustic soda was added and titrated, and this gave a testing solution for correcting the standard solution.

The process used for the estimation of nitrogen in /

~~acid~~ in the urine was a modification of F.G.Hopkin's method, taken from Guy's Hospital Reports, vol. 48, 1891, and may be termed Hopkin's short method for uric acid. It is sufficient to indicate the short method without going into detail by describing the long process.

To a 100 c.c.of urine made slightly alkaline with caustic soda (a few drops), add solid ~~sodium~~ ammonia chloride till saturated, 30 to 35 grammes; allow to stand for at least half-an-hour, occasionally stirring or shaking to prevent precipitation from floating on the top by high specific gravity. Filter the urine through an ash free filter paper, wash out contents of beaker with about 100 c.c. saturated ammonium chloride, and finally wash off precipitate on the ash free filter paper into a beaker by means of a jet of boiled distilled water. Transfer to a flask of 250 c.c. capacity, make up to 100 c.c., allow to cool, add 20 c.c. sulphuric acid of bench, titrate with permanganate of potassium standard solution, strength .00375.

Reading the burette before and after, carefully drop when you see the pink colour remaining for a more second or two, as a drop or two will give you the permanent /

permanent tint; then make your calculation from the standard solution. In these experiments it was standardised to ·00375.

Previous investigations.

Benzoate of sodium is a white feathery crystal of a peculiar agreeable odour and warm acidulous taste; sparingly soluble in cold water; more soluble in boiling water, which deposits it in part on cooling; very soluble in alcohol. (Bartholow, Materia Medica, p. 389.)

Bartholow in his Materia Medica states that benzoate of sodium has lately occupied a large place in professional attention. Having similar antiseptic and antipyretic properties to salicylate of sodium, and without any injurious effect, it is largely used in septic maladies. It has a good effect on febrile dieasess, and the results are more permanent than in the case of sulphate of quinine and salicylate of sodium. From 200 to 300 grains can be taken without inconvenience. Dr Klebs of Prague has used benzoate of /

of soda largely in acute infectious diseases, in tuberculous and catarrhal conditions of the bronchi. The principle underlying these suggestions is its antiseptic action. There are several other remedies having this power, but benzoate of soda stands very high for its antiseptic destruction of germs. Benzoate of soda has been largely used as a spray for diptheria and tuberculosis, and in typhoid and malarial fever, and acute rheumatism and whooping-cough.

Dr Rutherford, in Exp. 68 and 72A, showed that benzoate of soda possessed a marked stimulating effect on the liver.

Salkowski (Ztsch. f. Physiol. Chem., Bd. i. S. 45, 1877) performed two excellent experiments on a dog. The animal was put under a fixed diet, and a nitrogenous balance established.

Only two reliable experiments have as yet been made upon the action of the benzoates upon the nitrogen of the urine, although a considerable amount of attention has been paid to the influence of benzoate of soda and the benzoates on the urine.

Klitzinsky (Est. Ztsch. f. pract. Heilk., Bd. iv. S. /

S.41, 1858) is of opinion that no alteration in the nitrogenous matter in the urine occurs.

Meissner and Shepard ("Über das Enstehen der Hippursaüre im thier. Organismus," Hanover, 1866) state that hippuric acid is found when benzoic acid is given, there is no diminuation in the amount of urea.

C.Virchow (loc. cit.) has, under the direction of Salkowski, carried out two careful experiments, and found in the daily nitrogen excretion the rise well marked under the influence of benzoate of sodium. This agrees with what Salkowski found in his two experiments.

Garrod ("Lettsomian Lecture," Brit. Med. Jour., 1883, vol. 1) came to the conclusion that the benzoates have a very decided effect in diminishing the amount of uric acid. Two points in his experiments detract from their weight : the urine was not kept for twenty-four hours, and there was nothing mentioned as to fixed diet.

P. O. Jacobsen (Pharm. centralhalle, Dec. 22, 188, 566) referred to the report on the testing of benzoic /

benzoic acid by P. W. Bedford and Dr C. Schacht,and states that absolutely pure benzoic acid,--no matter from what source it is obtained,--is without action on permanganate of potassium. (See Year Book of Pharmacy and Transactions of the British Pharm. Conf., 1882.)

As to the effect of benzoic acid on the urine, W. Ashurst (Phil. Med. Journal, Feb. 24, 1900) explains the value when administered internally in the cystitis of gout and other catarrhal conditions of the bladder and urinary tract, and finds that this acid has a marked influence in retarding indefinitely the occurrence of alkaline fermentation in the urine, and that this influence is not due to its own acidity but to its antiseptic properties. The decomposition of urea into ammonia and carbon dioxide is prevented, and the dangers of ammoniacal cystitis and its complications avoided. The urine of patients taking benzoic acid can be exposed to the air for days without any appreciable development of bacterial life. (Year Book of Pharm., 1900, p. 77.)

The /

The few previous investigators that have done work on this subject have confined themselves to experimenting on dogs. The dog, while having advantages over man in the experimenter being able to keep the same dog for a length of time under observation, has many disadvantages. There is the difficulty of keeping the urine free from contamination with foreign matter, from contact with its faeces, or from lying among its urine.

MY OWN EXPERIMENTS.

The test cases on which my experiments are founded were treated in the Royal Infirmary.

Thomas Baillie and James Brown were selected for various reasons. They had no organic lesions that would interfere materially with the tissue metabolism. Their taking the benzoate of soda, also, was in no way deterring or detrimental, or retarding the progress of their treatment as hospital patients. It was necessary to have patients who were likely to remain in the hospital for some time, and in whom the intermission of the benzoate of soda could be carried out. Unfortunately both my experiments were cut short by /

by the patients wishing to return to their homes.

FIRST EXPERIMENT--THOMAS BAILLIE.

Thomas Baillie came to the Royal Infirmary with the following note from his doctor,--

"14 Arthur Street,

Newton Stewart, N.B.

"Thomas Baillie, millworker, left his work and his lodgings in the end of July; wandered about for ten days or a fortnight, sleeping out and half starved; was found in a barn on August 10th, semi-conscious, blood-stained sticky mucus oozing from mouth, body cold and emaciated. There was evidence of a general bronchitic condition when he was examined in bed. He rallied on the third day, and rapidly improved for a time. During last month, he complained of vomiting his food, but that was when he took something that did not suit him, or ate in a hurry.

"His tongue is clean and his bowels regular.

"He requires careful feeding and supervision.

"N. J. M'KIE,

"M.D.

"12/10/04."

The /

The History of the Case is briefly as follows :--

Thomas Baillie, age 34.

Creebridge, Minnigaff,

Newton Stewart.

Weaver.

Admitted--22nd October 1904.

Complaint--Weakness and vomiting.

History--Hereditary Tendencies.

Father died at about the age of 47. Mother at age of 45. Cause unknown to patient. Three half-brothers and sisters died young.

Habits--

Temperate as regards alcohol. Has always been well fed, and had a comfortable home, until this July; but then left home, and was lying out at nights, and was badly fed,-- principally biscuits,---and got a bad chill.

Previous Illnesses--

None, except an occasional cold. Has had no trouble at all with his stomach before.

Present Illness--

In the last week of July patient left home, and slept out at nights, and was very badly fed /

fed, and about the 9th of August he thinks he got a chill, and on the 10th was found in a barn, very ill and vomiting blood. He had never any vomiting before this. He was not suffering any pain except in the throat, and this pain was very severe, and prevented him from swallowing for several days, until the pain was relieved by linseed poultices. He has never been able to swallow bread or tea since,--they seemed to stick about the lower part of his neck,--and he just vomited them immediately. He managed to keep Bovril down as a rule, and cornflour and semolina. Sometimes he could not get rice and milk down at all. He feels thinner than he was now. Has no pain in his stomach, but has some slight pain across the back, and has a sort of grip in the throat, which is easier at some times than others.

State on Admission--

Height--5 ft. 3 in.

Weight--5 st. 13½ lb.

Muscularity and development poor.

Temperature--97·6.

Pulse /

Pulse 50.

No obvious morbid appearances.

Alimentary System--

Lips dry and rather blue.

Teeth fairly good; several at the back have been removed.

Gums rather pale, with veins showing distinctly.

Tongue moist and pale; some white fur about the back of it.

Fauces pale in colour.

Saliva present in sufficient quantity.

Deglutition---Cannot swallow solids at all at present, and only fluids with great difficulty, they being apt to stick at the root of his neck and be vomited up immediately after the attempt to swallow.

Appetite very poor indeed. No thirst. No discomfort when fasting. No pain during or after eating. He has no flatulence, but occasionally a feeling of wind in the throat. Since he has been on milk diet, he has been very constipated. His doctor has given him no medicine, all the time, but advised rest and change of diet.

Diagnosis /

Diagnosis--

Hysterical Dysphagia.

Result--Complete Cure.

Treatment--

Weir Mitchell.

The other systems of no clinical importance.

Thomas /

## THOMAS BAILLIE'S HOSPITAL CHARTS.

First chart.

| Date of Admission. | Name and Age of Patient. | Clinical Clerk. |
|---|---|---|
| 22/10/1904. | Thomas Baillie, 34. | Dr M'Kie. |

| Date. | Diet and Extras. | Date. | Remarks. | Date. | Medicines. |
|---|---|---|---|---|---|
| Oct. 22 | Milk diet. | Oct 26 | Height, 5 ft. 3 in. Weight, 5 st. 13½ lb. | Oct. 25 | ℞ Tinct. Card. Co., 2 drams. Aq. Menth. pip. ad 6 oz. A tablespoonful t.i.d. |
| Nov. 2 | Nutrient enemata. | Nov. 2 | Weight, 6 st. 2½ lb. | | |

Thomas /

Thomas Baillie,s first hospital chart continued.

| Temp. Far. | 1904 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | Nov. 1 | 2 | 3 | 4 | Temp. Cent. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 99 | Oct. | | | | | | | | | | | | | | | 37 |
| 98 | | | | | | | | | | | | | | | | |
| 97 | | | | | | | | | | | | | | | | 36 |
| 96 | | | | | | | | | | | | | | | | |
| Pulse | M | 50 | 52 | 48 | 60 | 64 | 70 | 52 | 54 | 54 | 62 | 56 | 56 | 70 | | |
| | E | | | | | | | | | | | | | | | |
| Motions | | 0 | 1 | 0 | 2 | 0 | 2 | 1 | 1 | 0 | 0 | 2 | 2 | 1 | 1 | |
| Urine, oz. | x | 40 | 45 | 35 | 30 | 25 | 35 | 30 | 30 | 32 | 30 | 35 | 44 | 40 | | |

On 22nd, calomel, 3 gr.

Thomas /

Thomas Baillie's second hospital chart.

| Date of Admission. | Name and Age of Patient. | Clinical Clerk. |
|---|---|---|
| 22/10/1904. | Thomas Baillie, 34. | Dr M'Kie. |

| Date. | Diet and Extras. | Date. | Remarks. | Date. | Medicines. |
|---|---|---|---|---|---|
| Nov. 2 | Nutrient enemata. | Oct 26 | Weight, 5 ft. 3 in. | | |
| | | Nov. 2 | Weight, 5 st. 13½ lb. | | |
| Nov. 8 | Milk diet. | | | | |
| | | Nov. 9 | Weight, 6 st. 6¾ lb. | | |
| | | Nov. 16 | Weight, 6 st. 5½ lb. | | |

Thomas /

Thomas Baillie's second hospital chart continued.

| Temp. Far. | 1904 Nov. | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | Temp. Cent. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 99 | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | 37 |
| 98 | | | | | | | | | | | | | | | | |
| 97 | | | | | | | | | | | | | | | | 36 |
| 96 | | | | | | | | | | | | | | | | |
| Pulse | M | 60 | 58 | 58 | 56 | 72 | 60 | 64 | 78 | 60 | 60 | 56 | 62 | 74 | 66 | |
| | E | | | | | | | | | | | | | | | |
| Motions | | 1 | 1 | 1 | 1 | 1 | 0 | 2 | 1 | 0 | 2 | 1 | 0 | 2 | 1 | |
| Urine oz. | | 72 | 80 | 44 | 46 | 40 | 50 | 40 | 54 | 60 | 24 | 62 | 42 | 28 | 15 | |

On 13th November, calomel 3 gr.

Thomas /

Thomas Baillie's third hospital chart.

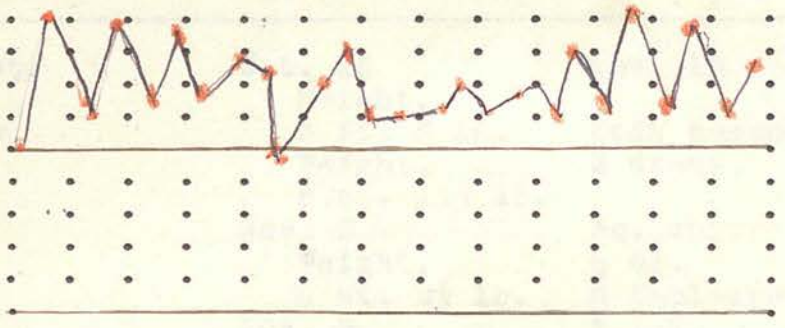
| Date of Admission. | Name and Age of Patient. | Clinical Clerk. |
|---|---|---|
| 22/10/1904. | Thomas Baillie, 34. | Dr M'Kie. |

| Date. | Diet and Extras. | Date. | Remarks. | Date. | Medicines. |
|---|---|---|---|---|---|
| | Milk diet, chicken soup, and beef tea. | Oct 26 | Height, 5 ft. 3 in. Weight, 5 st. 13½ lb. | Nov. 19 | Soda benzoate, 3 drams. Aq. chloroformi, 6 oz. A tablespoonful t.i.d. |
| | | Nov. 2 | Weight, 6 st. 2½ lb. | Nov. 24 | Two tablespoonfuls t.i.d. |
| | | Nov. 9 | Weight 6 st. 6¾ lb. | | |
| | | Nov. 16 | Weight, 6 st. 5¼ lb. | | |
| | | Nov. 23 | Weight, 6 st. 9¾ lb. | | |
| | | Nov. 30 | Weight, 6 st. 11½ lb. | | |

Thomas /

Thomas Baillie's third hospital chart continued.

| Temp. Far. | 1904 Nov. 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | Dec. 1 | 2 | Temp. Cent. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 99 | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | 37 |
| 98 | | | | | | | | | | | | | | | |
| 97 | | | | | | | | | | | | | | | 36 |
| 96 | | | | | | | | | | | | | | | |



| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pulse | M<br>E | 64 | 70 | 78 | 76 | 64 | 70 | 68 | 66 | 60 | 54 | 66 | 64 | 70 | 60 |
| Motions | | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 2 |
| Urine oz. | | 62 | 46 | 64 | 40 | 58 | 40 | 60 | 46 | 36 | 80 | 92 | 52 | 58 | 56 |

Thomas /

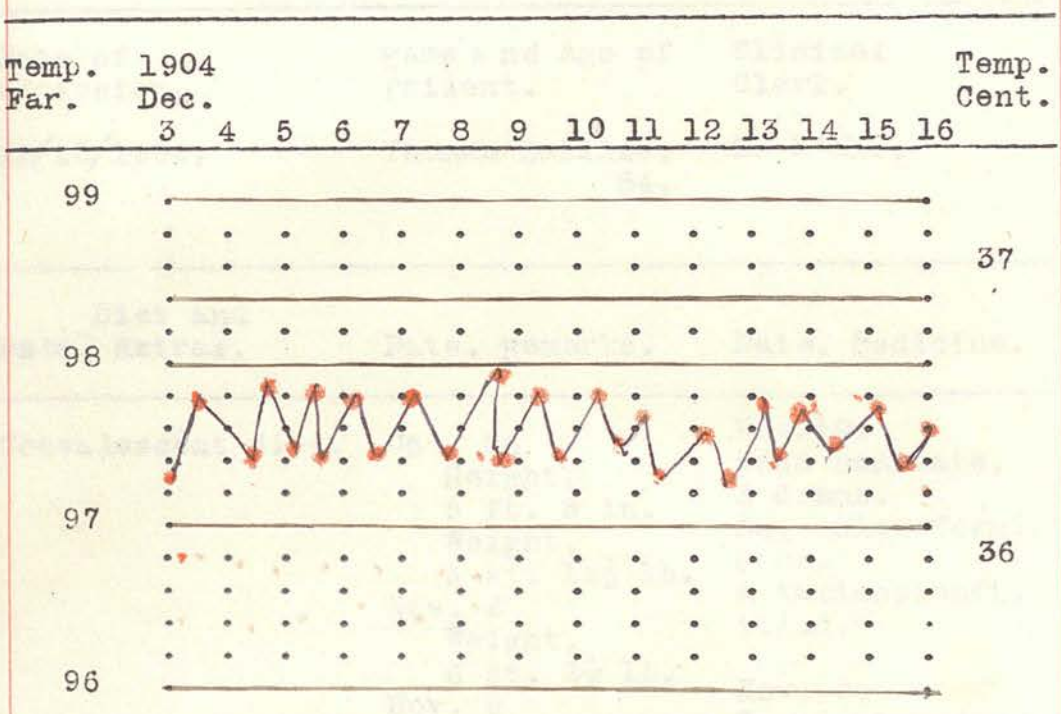
Thomas Baillie's fourth hospital chart.

| Date of Admission. | Name and Age of patient. | Clinical Clerk. |
|---|---|---|
| 22/10/1904. | Thomas Baillie, 34. | Dr M'Kie. |

| Date. | Diet and Extras. | Date. | Remarks. | Date. | Medicine. |
|---|---|---|---|---|---|
| | Milk diet, soup, porridge, fish. | Oct. 26 | Height, 5 ft. 3 in. Weight, 5 st. 13½ lb. | Nov. 19 | Soda benzoate, 3 drams. |
| | | Nov. 2 | Weight, 6 st. 2½ lb. | | Aq. chloroformi, 6 oz. A tablespoonful t.i.d. |
| | | Nov. 9 | Weight, 6 st. 6¾ lb. | Nov. 24 | Two tablespoonfuls, t.i.d. |
| | | Nov. 16 | Weight, 6 st. 5½ lb. | | |
| | | Nov. 23 | Weight, 6 st. 9¾ lb. | | |
| | | Nov. 30 | Weight, 6 st. 11½ lb. | | |
| | | Dec. 7 | Weight, 7 st. 0¾ lb. | | |
| | | Dec. 14 | Weight, 7 st. 1½ lb. | | |

Thomas /

Thomas baillie's fourth hospital chart continued.




| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pilse | M | 68 | 66 | 74 | 70 | 68 | 72 | 72 | 80 | 64 | 68 | 72 | 72 | 68 | 70 |
| | E | | | | | | | | | | | | | | |
| Motions | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Urine oz. | | 56 | 18x34 | | 46 | 64 | 60 | 50 | 44 | | 60 | 70 | 60 | 55 | 50 |

Thomas /

Thomas Baillie's fifth hospital chart.

| Date of Admission. | Name and Age of Patient. | Clinical Clerk. |
|---|---|---|
| 22/10/1904. | Thomas Baillie, 34. | Dr M'Kie. |

| Date. | Diet and Extras. | Date. | Remarks. | Date. | Medicine. |
|---|---|---|---|---|---|
| | Convalescent diet. | Oct. 26 | Height, 5 ft. 3 in. Weight, 5 st. 13½ lb. | Nov.19. | Soda benzoate, 3 drams. Aq. chloroformi, 6 oz. A tablespoonful t.i.d. |
| | | Nov. 2 | Weight, 6 st. 2½ lb. | Nov. 24 | Two tablespoonfuls t.i.d. |
| | | Nov. 9 | Weight, 6 st. 6¾ lb. | | |
| | | Nov. 16 | Weight, 6 st. 5½ lb. | | |
| | | Nov. 23 | Weight, 6 st. 9¾ lb. | | |
| | | Nov. 30, | Weight, 6 st. 11½ lb. | | |
| | | Dec. 7 | Weight, 7 st. 0¾ lb. | | |
| | | Dec. 14 | Weight, 7 st. 1½ lb. | | |
| | | Dec. 21 | Weight, 7 st. 0¾ lb. | | |

Thomas /

Thomas Baillie's fifth hospital chart continued.

| Temp. Far. | 1904 Dec. 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | Temp. Cent. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 99 | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | 37 |
| 98 | | | | | | | | | | | | | | | |
| 97 | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | 36 |
| 96 | | | | | | | | | | | | | | | |
| Pulse M | 88 | 64 | 62 | 74 | 72 | 72 | | | | | | | | | |
| E | | | | | | | | | | | | | | | |
| Motions | 1 | 0 | 1 | 2 | 1 | 1 | | | | | | | | | |
| Urine, oz. | 50 | 30 | 35 | x | x | x | | | | | | | | | |

Experiment /

Experiment No. 1.

Diet of Thomas Baillie.

October 22nd, 1904.

On his admission to the Royal Infirmary, he was put on milk diet, which consisted of milk and bread and butter, milk pudding, boiled bread and milk.

November 2nd, 1904.

Had nutriment enemata, which consisted of one egg, 1 oz. beef tea, 1 oz. cream peptomised.

November 8th, 1904.

Milk diet and soups.

November 15th, 1904.

The date of starting my experiments, his diet consisted of milk diet and chicken, soup, and beef tea.

Until December 17th, 1904, when it was changed to convalescent diet, which continued till he left on December 22nd, 1904.

Experiment No. 1.

The tables show the average daily excretion of various constituents under benzoate of soda. I did a check test on the urine of each date.

Thomas Baillie. Hysterical Dysphagia.

| 1904. Nov. | Sp. gr. | Reaction. | $KMnO_4$ | Uric acid. % | Uric acid. Nitrogen. |
|---|---|---|---|---|---|
| 15 | 1020 | Acid. | 46 | 0·1725 | ·0574 |
| " | " | " | 50 | 0·1875 | ·0624 |
| 16 | " | " | 42 | 0·1575 | ·0524 |
| " | " | " | 35 | 0·1312 | ·0436 |
| 17 | 1030 | " | 12 | 0·0450 | ·0149 |
| " | " | " | 14 | 0·0525 | ·0174 |
| 18 | " | " | 15 | 0·05625 | ·0187 |
| " | " | " | 13 | 0·04875 | ·0162 |
| 19 | 1027 | " | 12 | 0·04500 | ·0149 |
| " | " | " | 13 | 0·04875 | ·0162 |
| 20 | 1031 | " | 10 | 0·03750 | ·0124 |
| " | " | " | " | 0·03750 | ·0124 |
| 21 | 1027 | " | 9 | 0·03375 | ·0112 |
| " | " | " | " | 0·03375 | ·0112 |
| 22 | 1018 | " | 7 | 0·02625 | ·0087 |
| " | " | " | " | 0·02625 | ·0087 |

Experiment /

Experiment No. 1 continued.

Thomas Baillie's average excretion daily of various constituents under benzoate of soda, and condition of the blood.

| 1904 Nov. | Uric acid per diem. | Urine quan. in 24 hours. c.c. | R.C. | W.C. | Hae. % | Medicine and dose. | Fehling reaction. |
|---|---|---|---|---|---|---|---|
| 15 | 0·8625 | 500 | - | - | - | None. | None. |
| " | 0·9375 | " | - | - | - | - | " |
| 16 | 0·8662 | 550 | 1,850,000 | 4200 | 75 | Ben.sod. 15 grs. t.i.d. | " |
| " | 0·7218 | " | - | - | - | " | " |
| 17 | 0·3330 | 740 | - | - | - | " | " |
| " | 0·3885 | " | - | - | - | " | " |
| 18 | 0·2743 | 740 | - | - | - | " | " |
| " | 0·2291 | " | - | - | - | " | " |
| 19 | 0·2250 | 500 | - | - | - | " | " |
| " | 0·2337 | " | - | - | - | " | " |
| 20 | 0·3412 | 910 | - | - | - | " | Slight. |
| " | 0·3412 | " | - | - | - | " | " |
| 21 | 0·4387 | 1300 | - | - | - | " | None. |
| " | 0·4387 | " | - | - | - | " | " |
| 22 | 0·4830 | 1800 | - | - | - | " | " |
| " | 0·4830 | " | - | - | - | Medicine stopped. | " |

Experiment /

Experiment No. 1 continued.

The tables show the daily average excretion of various constituents under benzoate of soda.

Thomas Baillie. Hysterical Dysphagia. (Continued.)

| 1904. Nov. | Sp. gr. | Reaction. | $KMnO_4$ | Uric acid. % | Uric acid. Nitrogen. |
|---|---|---|---|---|---|
| 23 | 1025 | Acid. | 14 | 0·05250 | ·0174 |
| " | " | " | " | 0·05250 | ·0174 |
| 24 | 1030 | " | 7 | 0·02625 | ·0087 |
| " | " | " | " | 0·02625 | ·0087 |
| 25 | 1027 | Alk. | " | 0·02625 | ·0087 |
| " | " | " | " | 0·02625 | ·0087 |
| 26 | 1018 | Acid. | 6 | 0·02250 | ·0074 |
| " | " | " | " | 0·02250 | ·0074 |
| 27 | 1025 | " | 12 | 0·0450 | ·0149 |
| " | " | " | 13 | 0·04875 | ·0159 |
| 28 | 1030 | " | " | 0·04875 | ·0159 |
| " | " | " | 14 | 0·0525 | ·0174 |

Experiment /

Experiment No. 1 continued.

Thomas Baillie's average daily excretion of various constituents under benzoate of soda, and condition of the blood.

(Continued.)

| 1904 Nov. | Uric acid per diem. | Urine quan. in 24 hours. c.c. | R.C. | W.C. | Hae. % | Medicine and dose. | Fehling reaction. |
|---|---|---|---|---|---|---|---|
| 23 | 0·5750 | 1100 | 1,950,000 | 3400 | 80 | Medicine stopped. | None. |
| " | 0·5750 | " | - | - | - | " | " |
| 24 | 0·3937 | 1540 | - | - | - | Ben.sod. 30 grs. t.i.d. | " |
| " | 0·3937 | " | - | - | - | " | " |
| 25 | 0·3937 | 1150 | 3,080,000 | 4400 | 90 | " | " |
| " | 0·3937 | " | - | - | - | " | " |
| 26 | 0·3690 | 1640 | - | - | - | " | " |
| " | 0·3690 | " | - | - | - | " | " |
| 27 | 0·5355 | 1190 | - | - | - | " | " |
| " | 0·5801 | " | - | - | - | " | " |
| 28 | 0·5801 | 1000 | - | - | - | " | Reduced. |
| " | 0·5250 | " | - | - | - | " | " |

Experiment /

Experiment No. 1 continued.

The tables show the daily average excretion of various constituents under benzoate of soda.

Thomas Baillie. Hysterical Dysphagia.

(Continued.)

| 1904. Nov. | Sp. gr. | Reaction. | $KMnO_4$ | Uric acid. % | Uric acid Nitrogen. |
|---|---|---|---|---|---|
| 29 | 1018 | Acid. | 5 | 0·01875 | ·0062 |
| " | " | " | " | 0·01875 | ·0062 |
| 30 | 1015 | " | 12 | 0·0450 | ·0149 |
| " | " | " | " | 0·0450 | ·0149 |
| Dec. 1 | 1020 | " | 10 | 0·03750 | ·0125 |
| " | " | " | 8 | 0·0300 | ·0099 |
| 2 | 1028 | " | 24 | 0·0900 | ·0029 |
| " | " | " | " | 0·0900 | ·0029 |
| 3 | 1017 | " | 17 | 0·06375 | ·0211 |
| " | " | " | " | 0·06375 | ·0211 |

Experiment /

Experiment No. 1 continued.

Thomas Baillie's average daily excretion of various constituents under benzoate of soda, and condition of the blood.

(Continued.)

| 1904 Nov. | Uric acid per diem. | Urine quan. in 24 hours. c.c. | R.C. | W.C. | Hae. % | Medicine and dose. | Fehling reaction. |
|---|---|---|---|---|---|---|---|
| 29 | 0·2437 | 1300 | - | - | - | Stopped. | None. |
| " | 0·2437 | " | - | - | - | " | " |
| 30 | 1·2315 | 2670 | - | - | - | " | " |
| " | 1·2315 | " | - | - | - | " | " |
| Dec. 1 | 0·5512 | 1470 | - | - | - | " | " |
| " | 0·441 | " | - | - | - | " | " |
| 2 | 1·2600 | 1400 | - | - | - | " | " |
| " | 1·2600 | " | - | - | - | " | " |
| 3 | 0·2805 | 440 | - | - | - | " | " |
| " | 0·2805 | " | - | - | - | " | " |

Fig. /

FIG. I.

Thomas Baillie.--Chart showing the effect of benzoate of soda on amount of water excreted. 15 grs at A. 30 grs. at B. Thrice daily.

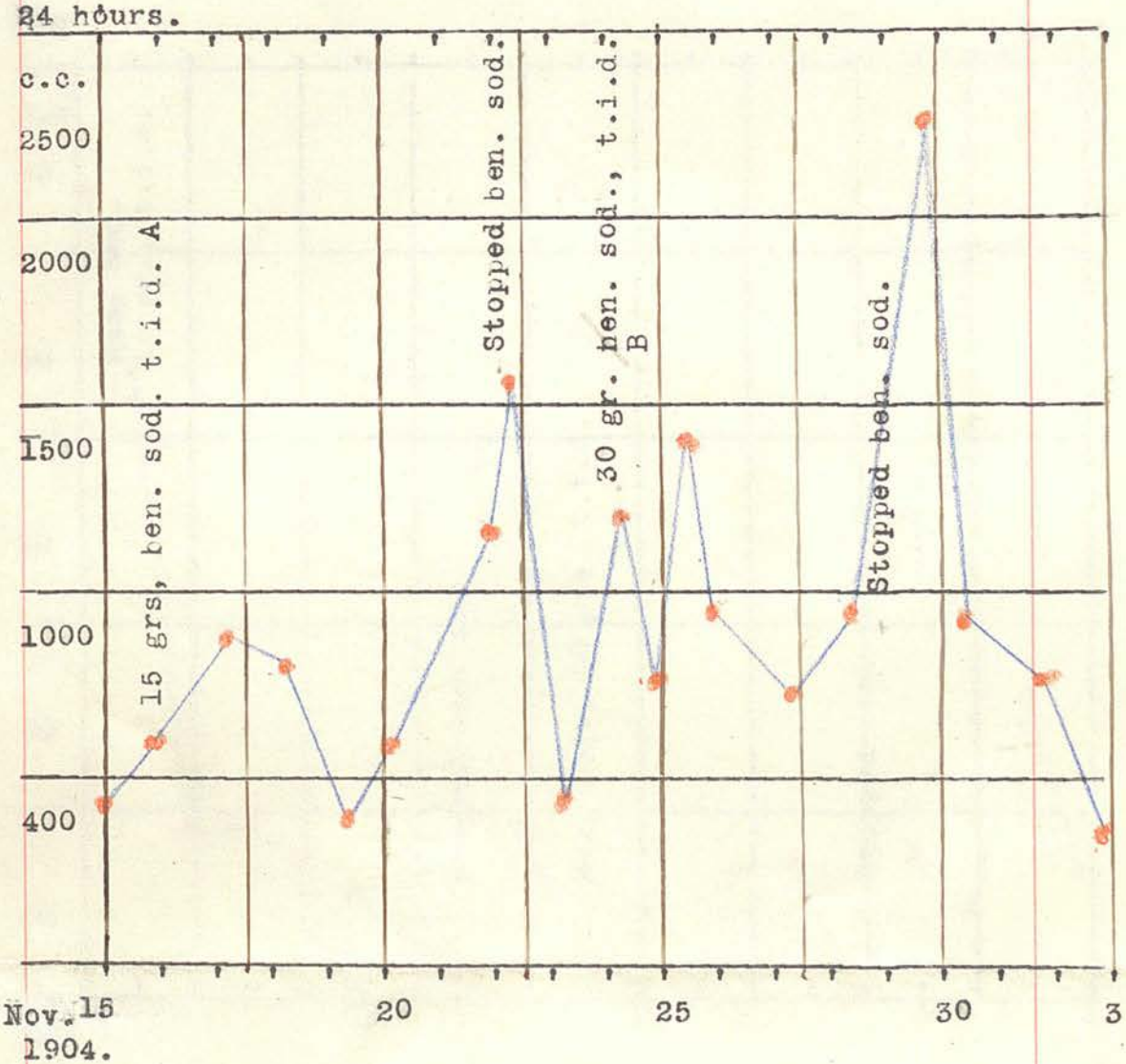



Fig. /

FIG. II.

Thomas Baillie.--Chart showing the effect of benzoate of soda as indicated by the reducing effect of permanganate of potassium.

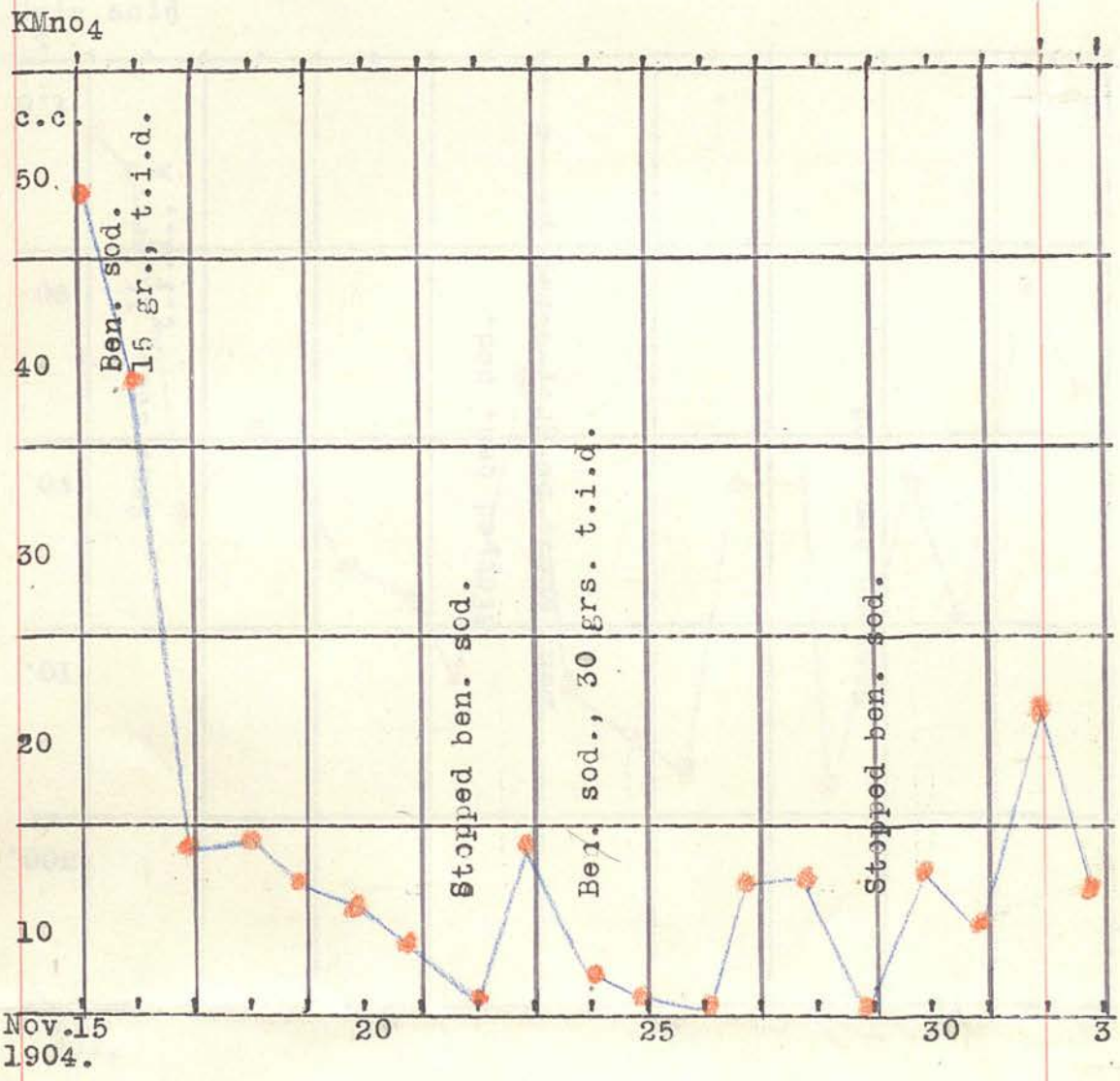



Fig. /

FIG. III.

Thomas Baillie.---Chart showing % and the effect under benzoate of soda on excretion of uric acid at A 15 gr. and at B 30 gr., t.i.d.

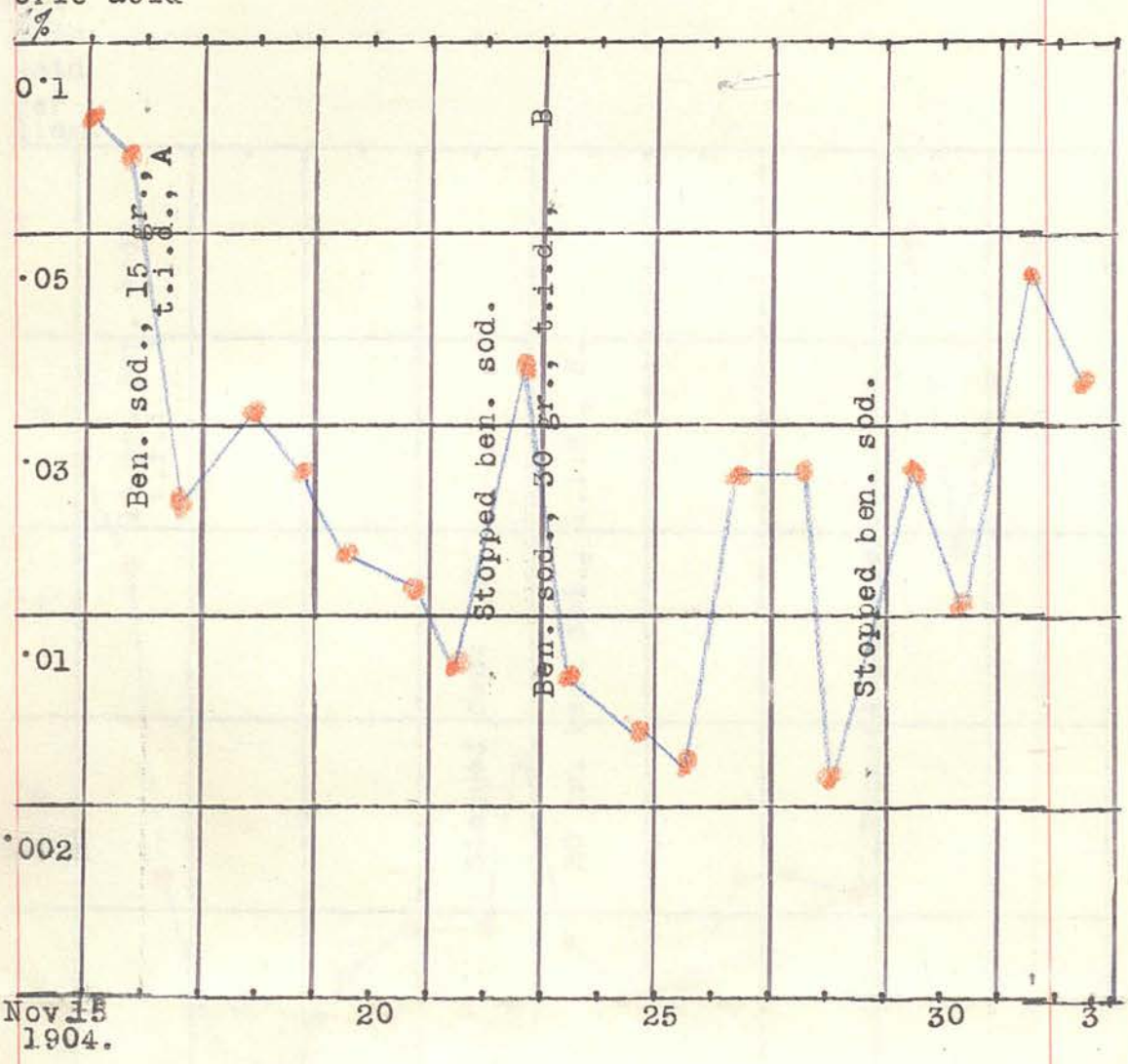



Fig. /

FIG. IV.

Thomas Baillie.--Chart showing the fall in the amount of uric acid per diem under benzoate of soda, at A, 15 gr., and at B, 30 gr., t.i.d.

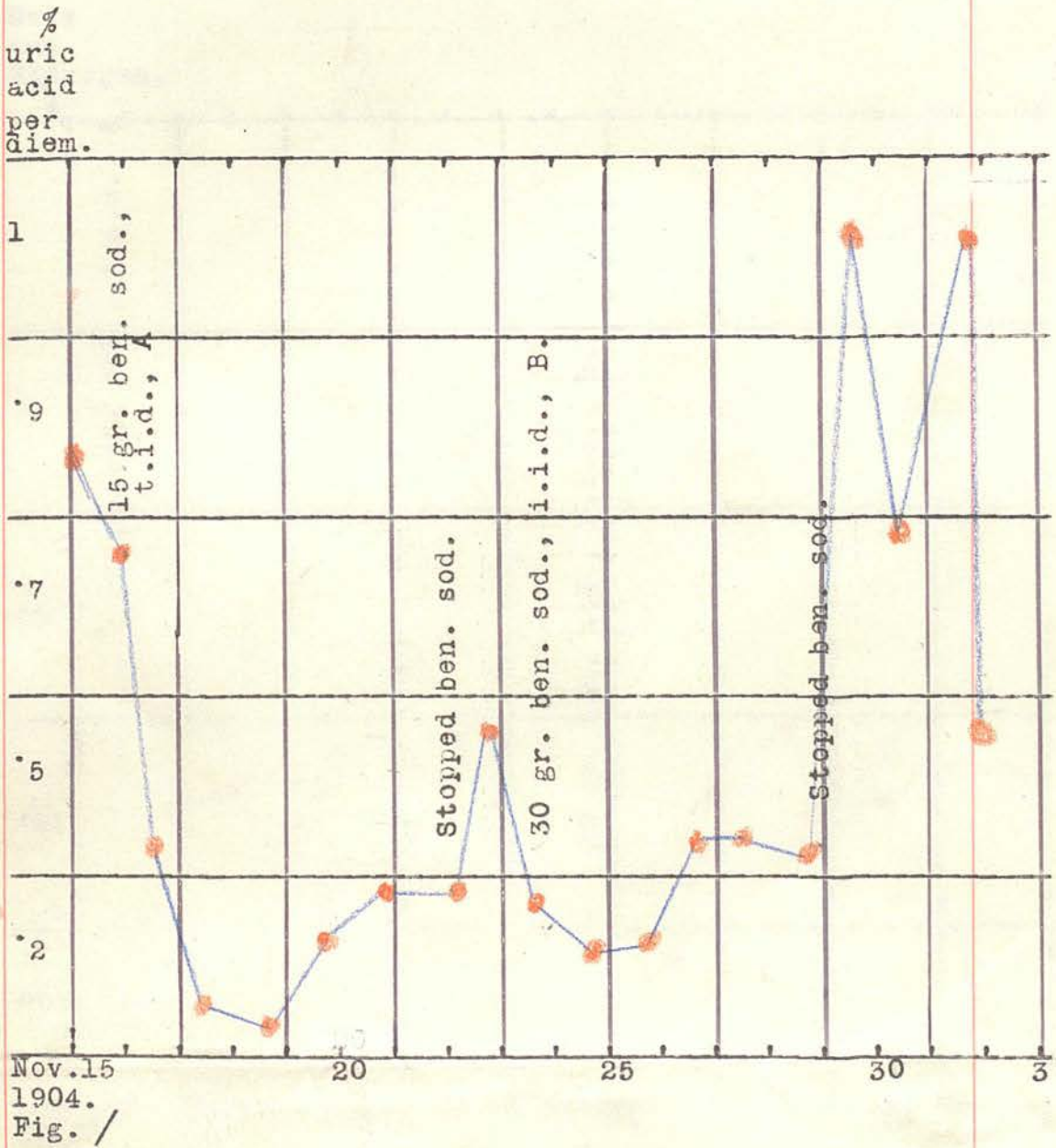



Fig. /

FIG. V.

Thomas Baillie.--Chart of uric acid nitrogen, showing reduction of nitrogen under benzoate of soda, 15 gr. at A, 30 gr. at B, t.i.d.

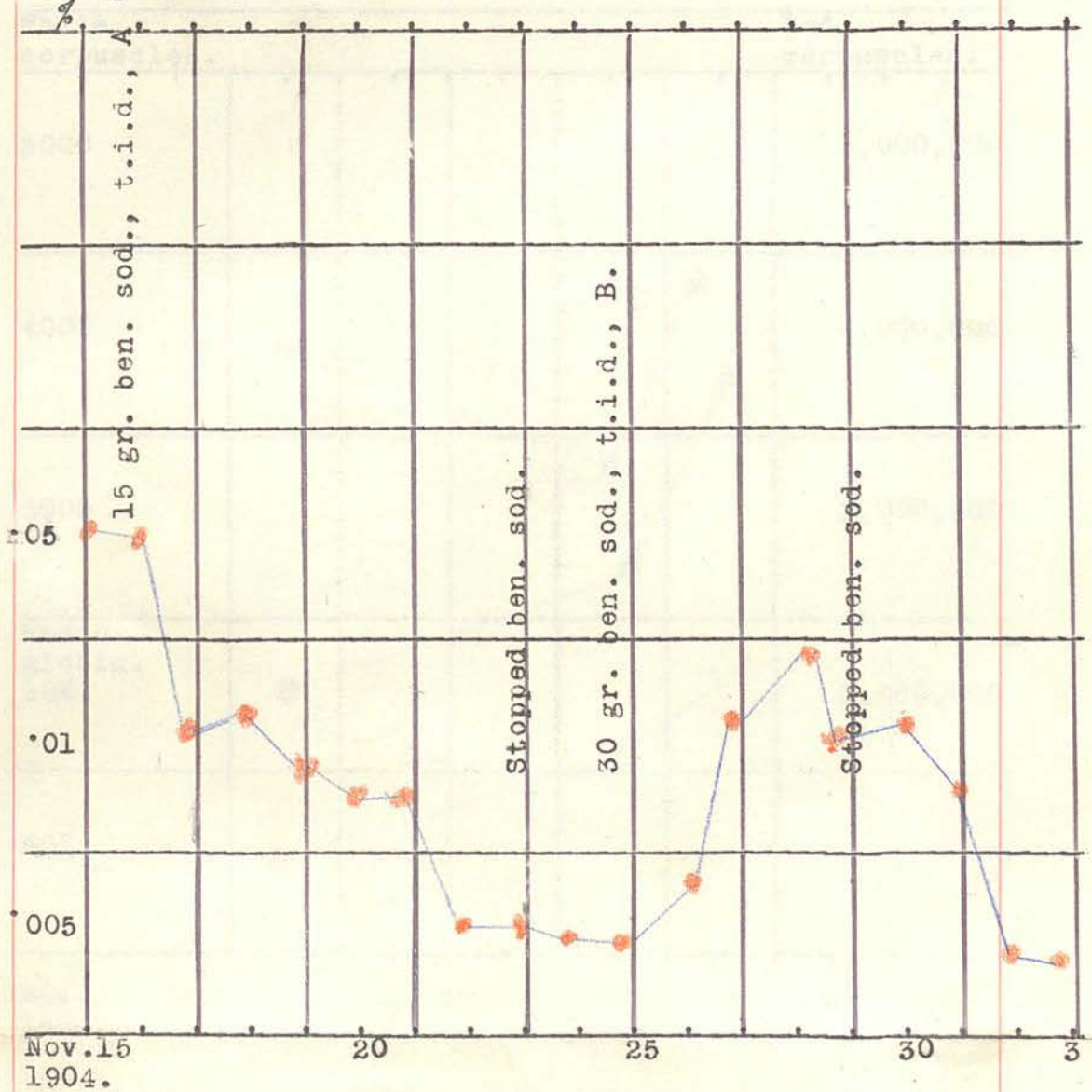



Fig. /

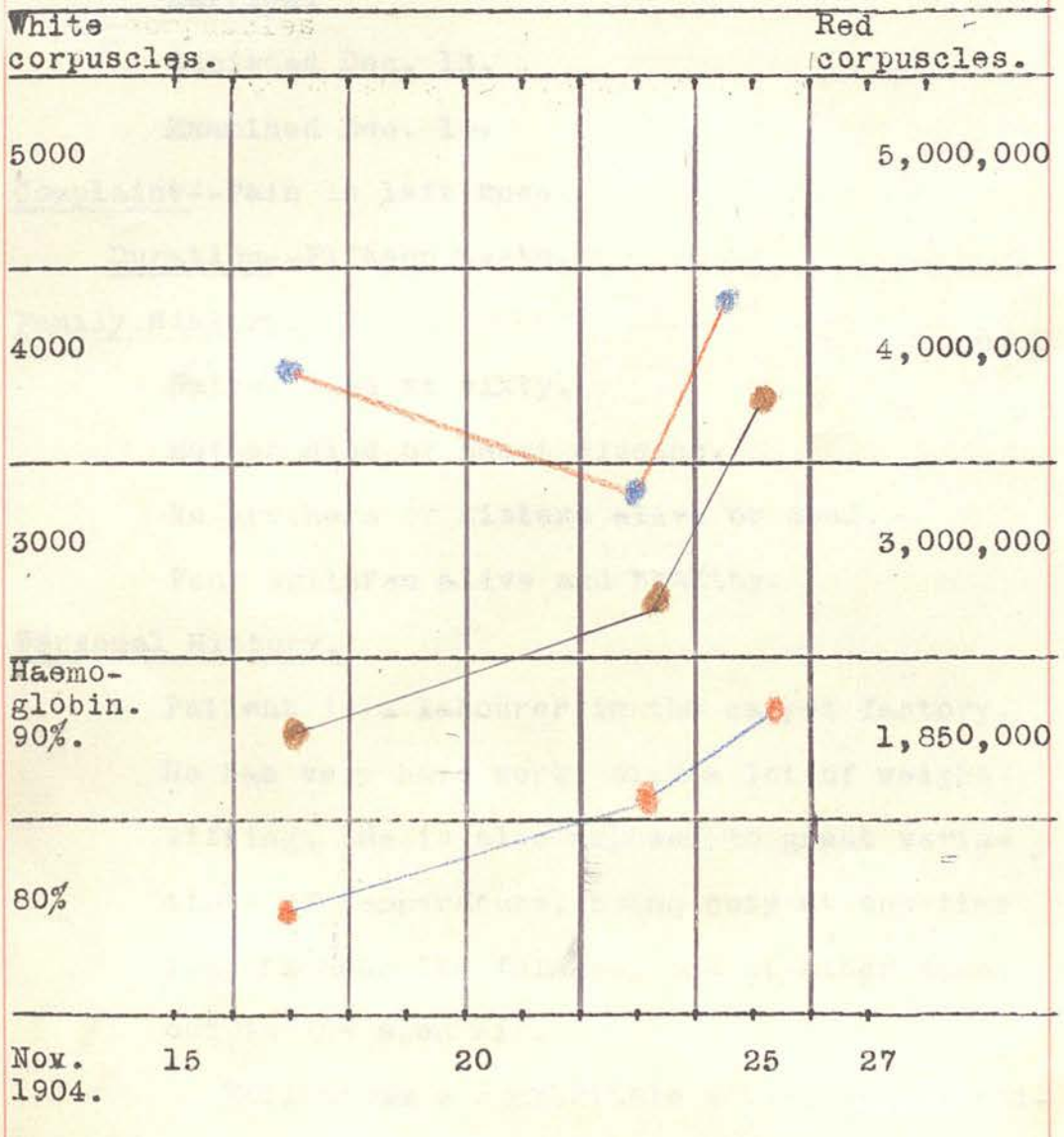
FIG. VI.

Thomas Baillie,--Chart showing the effect on the blood under benzoate of soda.

Red--Haemoglobin.

Blue--White Corpuscles.

Brown--Red corpuscles.




Second /

SECOND EXPERIMENT--JAMES BROWN.

The History of the Case is briefly as follows :--

Thomas Brown, aged 60.

19 Westfield park, Eskbank.

Labourer.

Married.

Admitted Dec. 13.

Examined Dec. 14.

Complaint--Pain in left knee.

Duration--Fifteen weeks.

Family History.

Father died at sixty.

Mother died of heart disease.

No brothers or sisters alive or dead.

Four children alive and healthy.

Personal History.

Patient is a labourer in the carpet factory. He has very hard work, with a lot of weight lifting. He is also exposed to great variations of temperature, being busy at one time indoors near the furnace, and at other times out in the open air.

Patient has a comfortable house, well ventilated; his meals are regular, and he has plenty/

plenty of good plain food.

He does not take much tea. He has a glass of beer for dinner every day. He smokes 2 oz. of tobacco per week.

Previous Illnesses.

Rheumatism in both shoulders six years ago.

Present Illness.

About fifteen weeks ago, while patient was coming downstairs carrying a heavy weight, he twisted his left knee, causing him violent pain. He fell to the ground as the result of the pain, and remained there for about an hour unable to move his leg; but the pain seemed to get less after a time so that he managed to get up and hobble home. When he got home, very soon after this his knee began to swell up. He then sent for the doctor, who blistered his knee. This very considerably relieved the pain and reduced the swelling. Two or three days after this he began to walk about a little, and made his leg worse. It was again blistered.

He has had exacerbations of the pain ever since /

since. The pain is of a shooting character, much worse when he extends his knee.

He has only walked about the house during these last three months, and, as he was getting no better, the doctor advised him to come in here.

General condition.

General intelligence good.

Development fair.

His expression is bright and cheerful.

No pallor, jaundice, or cyanosis.

Nothing special to note about the hands.

No glandular enlargements.

Respiration abdominal, thoracic.

No cough.

Temp., 90·9.

Locomoter System.

Inspection.

Over the inner left knee joint there is a good deal of swelling. This is even more marked over the right knee.

On palpation, swelling and thickening can be made out round about the knee joint. There is also "dipping" /

"dipping" of both knee joints. The mobility of the left knee is impaired to a considerable extent. He can flex his knee pretty well, but has considerable difficulty and pain in extending the joint.

There is no difference of temperature between the two knees.

Diagnosis.--Rheumatoid Arthritis.

Treatment.--Electric baths, &c.

Result,--Almost cured.

The other systems showed no features of importance.

The /

The ordinary diet consisted of

Breakfast.--Porridge and milk, tea, bread and butter.

Lunch.--Milk and bread and butter.

Dinner.--Broth, beef or mutton ($\frac{1}{2}$ lb.) and potatoes, milk pudding.

Tea.--Tea and bread and butter.

(Occasionally an egg.)

Supper,--Milk and bread and butter.

The quantity of milk given at a time is about half a pint.

James /

JAMES BROWN'S FIRST HOSPITAL CHART.

| Date of Admission. | Name and Age of Patient. | Clinical Clerk. |
|---|---|---|
| 13/12/1904. | James Brown, 60. | Dr Blackstock. |

| Date. Diet and Extras. | Date. Remarks. | Date. Medicines. |
|---|---|---|
| Ordinary diet. | Dec. 14<br>Height,<br>5 ft. 8 in.<br>Weight,<br>10 st. 7½ lb. | Dec. 14<br>R Quin. Salicyl. 10 gr. t.i.d. |
| | Dec. 21<br>Weight,<br>10 st. 10 lb. | Stopped. |
| | | Dec. 15<br>R Tinct. Card. Co., 2 drams. Aq. Menth. Pip., ad 6 oz. Tablespoonful three times a day. |

James /

John Brown's first hospital chart, continued.

| Temp. Far. | 1904. Dec. | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | Temp. Cent. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 99 | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | 37 |
| 98 | | | | | | | | | | | | | | | | |
| 97 | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | 36 |
| 96 | | | | | | | | | | | | | | | | |
| Pulse | M | 74 | 80 | 90 | 88 | 74 | 78 | 76 | 84 | 76 | 78 | 84 | 76 | 76 | 92 | |
| | E | | | | | | | | | | | | | | | |
| Motions | | 1 | 0 | 1 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | |
| Urine oz. | | 25 | 30 | 10x45 | x | 60 | 50 | 43 | 50 | 50 | 55 | 70 | 65 | 50 | | |

Calomel, 3 gr., on 14th Dec.

James /

JAMES BROWN'S SECOND HOSPITAL CHART.

| Date of Admission. | Name and Age of Patient. | Clinical Clerk. |
|---|---|---|
| 13/12/1904. | James Brown, 60. | Dr Blackstock. |

| Date. | Diet and Extras. | Date. | Remarks. | Date. | Medicines. |
|---|---|---|---|---|---|
| | Ordinary diet. | Dec. 14 | Height, 5 ft. 8 in. Weight, 10 st. 7½ lb. | Dec. 15 | ℞ Tinc. Card. Co., 2 drams. Aq. Menth. pip, ad 6 oz. Tablespoonful three times a day. |
| | | Dec. 21 | Weight, 10 st. 10 lb. | | |
| | | Dec. 28, | Weight, 10 st. 11¼ lb. | | |
| | | Jan. 4 | Weight, 10 st. 12 lb. | | |

James /

James Brown's second hospital chart, continued.

| Temp. Far. | 1904. Dec. 27 | 28 | 29 | 30 | 31 | 1905. Jan. 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | Temp. Cent. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 99 | | | | | | | | | | | | | | | 37 |
| 98 | | | | | | | | | | | | | | | |
| 97 | | | | | | | | | | | | | | | 36 |
| 96 | | | | | | | | | | | | | | | |
| Pulse M | 64 | | 84 | 76 | 76 | 80 | 92 | 82 | 80 | 74 | 80 | 88 | 84 | 78 | |
| E | | | | | | | | | | | | | | | |
| Motions | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 3 | 2 | 1 | 1 | 1 | 1 | 1 | |
| Urine oz. | 40 | 48 | 50 | 72 | 56 | 55 | 47 | 31 | 34 | 48 | 64 | 44 | 62 | 40 | |

Patient got up on Jan. 5.

Experiment /

Experiment No. 2.

The tables show the daily average excretion of various constituents under benzoate of soda. I did a check test on the urine of each date.

James Brown. Rheumatoid Anthritis.

| 1904. Dec. | Sp. gr. | Reaction. | $KMnO_4$ | Uric acid % | Uric acid per diem. | Urine quan. in 24 hours. |
|---|---|---|---|---|---|---|
| | | | | | | c.c. |
| 16 | 1015 | Acid. | 7 | ·02625 | ·0525 | 200 |
| " | " | " | " | " | " | " |
| 17 | 1013 | " | " | ·0225 | ·3825 | 1700 |
| " | " | " | " | " | " | " |
| 18 | - | - | - | - | - | - |
| 19 | 1017 | " | 15 | ·0562 | ·9225 | 1640 |
| " | " | " | " | " | " | " |
| 20 | 1013 | " | 13 | ·04875 | ·6630 | 1360 |
| " | " | " | " | " | " | " |
| 21 | 1021 | " | 13 | ·0487 | ·5752 | 1180 |
| " | " | " | " | " | " | " |
| 22 | 1015 | " | 11 | ·04125 | ·5694 | 1380 |
| " | " | " | " | " | " | " |

Experiment /

Experiment No. 2 continued.

James Brown's daily average excretion of various constituents under benzoate of soda, and condition of the blood.

| 1904 Dec. | Uric acid Nitrogen. | Nitrogen. | R.C. | W.C. | Hae. % | Medicine and dose. | Fehling reaction. |
|---|---|---|---|---|---|---|---|
| 16 | ·0087 | - | - | - | - | | None. |
| " | ·0084 | - | - | - | - | | " |
| 17 | ·0074 | - | - | - | - | | None. |
| " | ·0074 | - | - | - | - | | - |
| 18 | | - | 4,460,000 | 4200 | 87 | | - |
| 19 | ·0187 | ·57 | - | - | - | | None. |
| " | ·0187 | " | - | - | - | | - |
| 20 | ·0162 | ·74 | - | - | - | | None. |
| " | ·0162 | ·74 | - | - | - | | " |
| 21 | ·0162 | - | 4,370,000 | 4800 | 90 | Started Ben. sod. 30 gr. t.i.d. | " |
| " | ·0162 | - | - | - | - | " | " |
| 22 | ·0137 | ·736 | - | - | - | " | " |
| " | ·0137 | ·678 | - | - | - | " | " |

Experiment /

Experiment No. 2 contimued.

The tables show the daily average excretion of various constituents under benzoate of soda.

James Brown. Rheumatoid Arthritis.

(Continued.)

| 1904. Dec. | Sp. gr. | Reaction. | $KMnO_4$ | Uric acid % | Uric acid per diem. | Urine quan. in 24 hours. |
|---|---|---|---|---|---|---|
| | | | | | | c.c. |
| 23 | 1020 | Acid. | 10 | ·0375 | ·5625 | 1500 |
| " | " | " | " | " | " | " |
| 24 | 1020 | " | 9 | ·03375 | ·50625 | 1500 |
| " | " | " | " | " | " | " |
| 25 | 1015 | " | 8 | ·0300 | ·666 | 2220 |
| " | " | " | " | " | " | " |
| 26 | 1018 | " | 10 | ·0375 | ·5100 | 1360 |
| " | " | " | " | " | " | " |
| 27 | 1019 | Acid. | 11 | ·0487 | ·6045 | 1240 |
| " | " | " | " | " | " | " |
| 28 | - | - | - | - | - | - |
| 29 | 1020 | " | 11 | ·0452 | ·5032 | 1220 |
| " | " | " | " | " | " | " |
| 30 | 1020 | " | 10·5 | ·0393 | ·5197 | 1320 |
| " | " | " | " | " | " | " |
| 31 | 1017 | " | 8 | ·0300 | ·5670 | 1890 |
| " | " | " | " | " | " | " |

Experiment /

Experiment No. 2 continued. James Brown.

| 1904 Dec. | Uric acid Nitro-gen. | Nitro-gen. | R.C. | W.C. | Hae. % | Medi-cine and dose. | Fehling reac-tion. |
|---|---|---|---|---|---|---|---|
| 23 | ·0125 | ·658 | - | - | - | 30 gr. ben.sod. | None. |
| " | ·0125 | ·689 | - | - | - | " | " |
| 24 | ·0112 | ·605 | - | - | - | Stopped. | " |
| " | ·0112 | ·602 | - | - | - | " | " |
| 25 | ·0099 | ·445 | 3,410,000 | 4000 | 87 | " | " |
| " | ·0099 | ·431 | - | - | - | " | " |
| 26 | ·0125 | ·554 | - | - | - | " | " |
| " | ·0125 | ·542 | - | - | - | " | " |
| 27 | ·0159 | ·638 | 4,250,000 | 3800 | 85 | " | " |
| " | ·0159 | ·657 | - | - | - | " | " |
| 28 | - | - | - | - | - | Started ben. sod. 30 gr. t.i.d. | - |
| 29 | ·0137 | ·692 | - | - | - | " | " |
| " | ·0137 | " | - | - | - | " | " |
| 30 | ·0130 | ·658 | - | - | - | " | " |
| " | ·0130 | " | - | - | - | " | " |
| 31 | ·0099 | ·538 | 4,670,000 | 3400 | 90 | " | " |
| " | ·0099 | " | - | - | - | " | " |

Experiment /

Experiment No. 2 continued.

The tables show the daily average excretion of various constituents under benzoate of soda.

James Brown. Rheumatoid Arthritis.

(Continued.)

| 1905. Jan. | Sp. gr. | Reaction. | $KMnO_4$ | Uric acid % | Uric acid per diem. | Urine quan. in 24 hours. |
|---|---|---|---|---|---|---|
| | | | | | | c.c. |
| 1 | 1016 | Acid. | 10 | ·0375 | ·4875 | 1300 |
| " | " | " | " | " | " | " |
| 2 | - | - | - | - | - | - |
| 3 | 1017 | Acid. | 11 | ·0412 | ·495 | 1200 |
| " | " | " | " | " | " | " |
| 4 | 1024 | " | 18 | ·0675 | ·513 | 760 |
| " | " | " | 19 | ·0712 | ·5414 | " |
| 5 | 1023 | " | 16·5 | ·0618 | ·5816 | 940 |
| " | " | " | " | " | " | " |
| 6 | 1020 | Acid. | 10·5 | ·0393 | ·6496 | 1650 |
| " | " | " | " | " | " | " |
| 7 | 1015 | " | 9 | ·0337 | ·6446 | 1910 |
| " | " | " | 9·5 | ·0356 | ·6704 | " |
| 8 | 1022 | Acid. | 14 | ·0525 | ·6562 | 1250 |
| " | " | " | " | " | " | " |
| 9 | 1020 | " | 9 | ·0337 | ·6176 | 1830 |
| " | " | " | " | " | " | " |
| 10 | 1015 | " | 11 | ·0412 | ·4578 | 1110 |
| " | " | " | " | " | " | " |

Experiment /

Experiment No. 2 continued. James Brown.

| 1905 Jan. | Uric acid Nitro-gen. | Nitro-gen. | R.C. | W.C. | Hae. % | Medi-cine and dose. | Fehling reac-tion. |
|---|---|---|---|---|---|---|---|
| 1 | ·0125 | ·529 | - | - | - | Stopped. | None. |
| " | ·0125 | ·507 | - | - | - | " | " |
| 2 | - | - | - | - | - | - | - |
| 3 | ·0137 | ·725 | - | - | - | " | " |
| " | ·0137 | ·711 | - | - | - | " | " |
| 4 | ·0224 | 1·044 | - | - | - | " | " |
| " | ·0237 | 1·019 | - | - | - | " | " |
| 5 | ·0205 | 1·106 | - | - | - | " | " |
| " | ·0205 | 1·103 | - | - | - | " | " |
| 6 | ·0130 | ·820 | - | - | - | Started. ben. sod. 30 gr. t.i.d. | " |
| " | ·0130 | ·" | - | - | - | " | " |
| 7 | ·0112 | ·664 | - | - | - | " | " |
| " | ·0118 | " | - | - | - | " | " |
| 8 | ·0117 | ·832 | - | - | - | " | " |
| " | ·0117 | ·753 | - | - | - | " | " |
| 9 | ·0112 | ·664 | - | - | - | " | " |
| " | ·0112 | ·655 | - | - | - | " | " |
| 10 | ·0137 | ·664 | - | - | - | " | " |
| " | ·0137 | ·" | - | - | - | " | " |

Fig. /

FIG. VII.

James Brown.--Chart showing the effect of benzoate of soda on amount of water,--30 gr. of benzoate of soda, t.i.d.

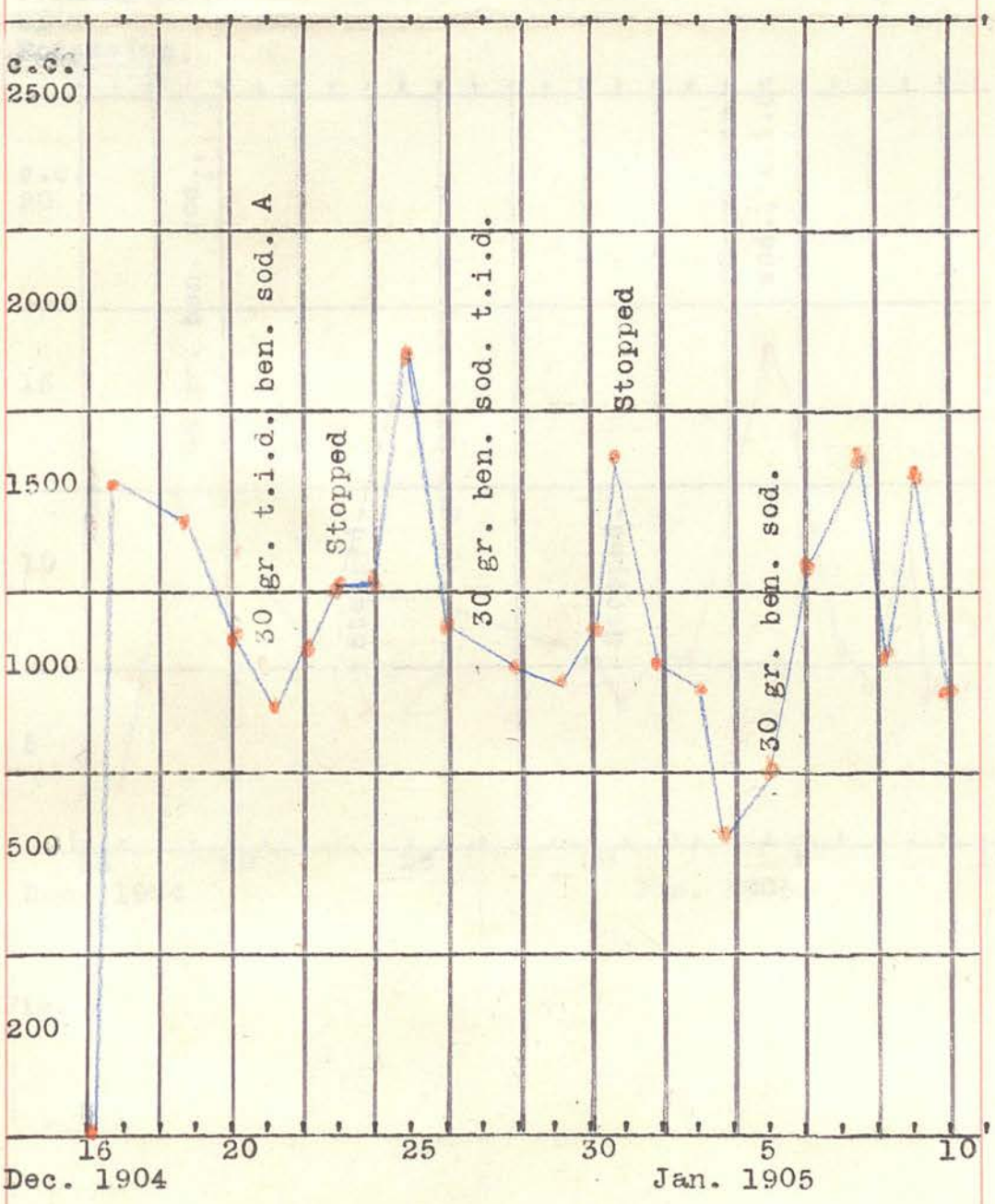



Fig. /

FIG. VIII.

James Brown.--Chart showing effect of benzoate of soda as indicated by reducing effect of permanganate of potassium.

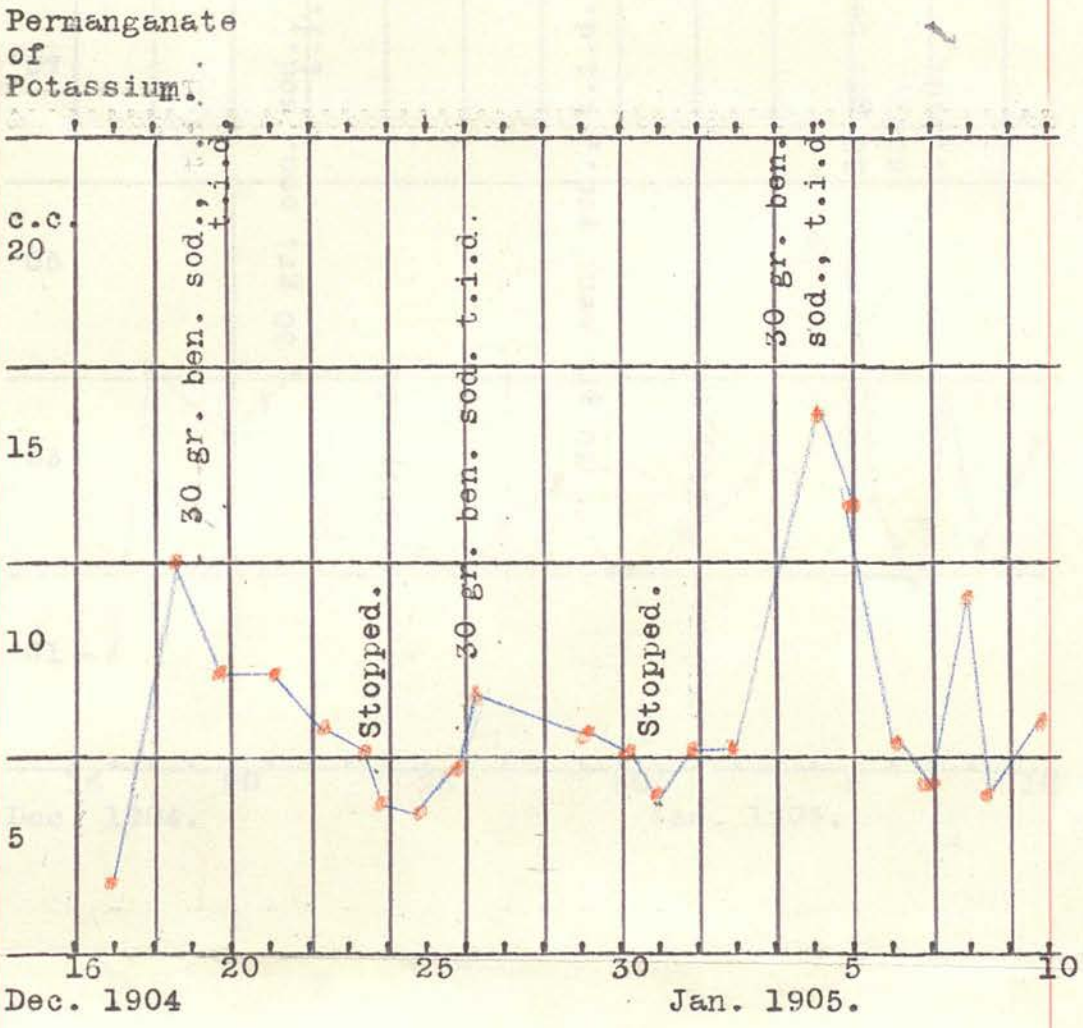



Fig. /

FIG. IX.

James Brown.--Chart showing % of the effect of ben. soda on excretion of uric acid,--30 gr. thrice daily.

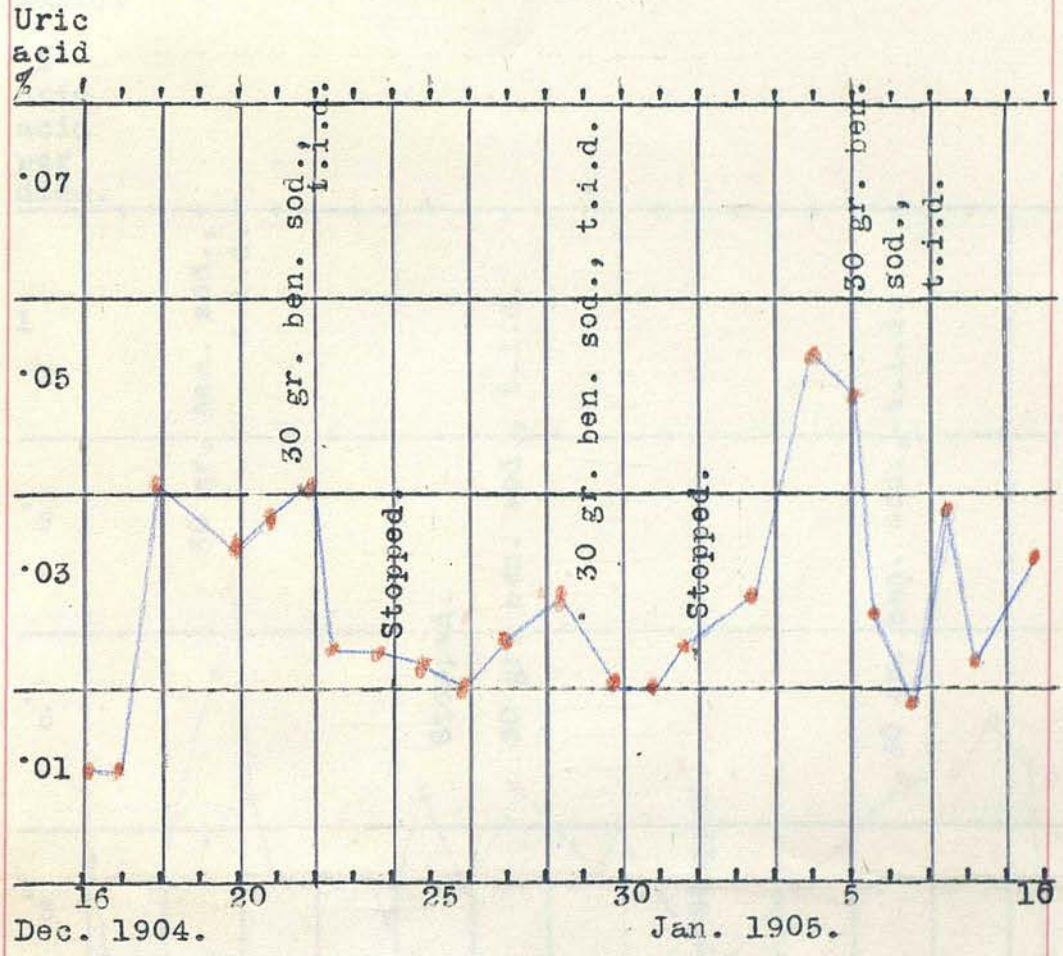



Fig. /

FIG. X.

James Brown.--Chart showing the fall in amount of uric acid per diem under benzoate of soda,--30 gr. thrice daily.

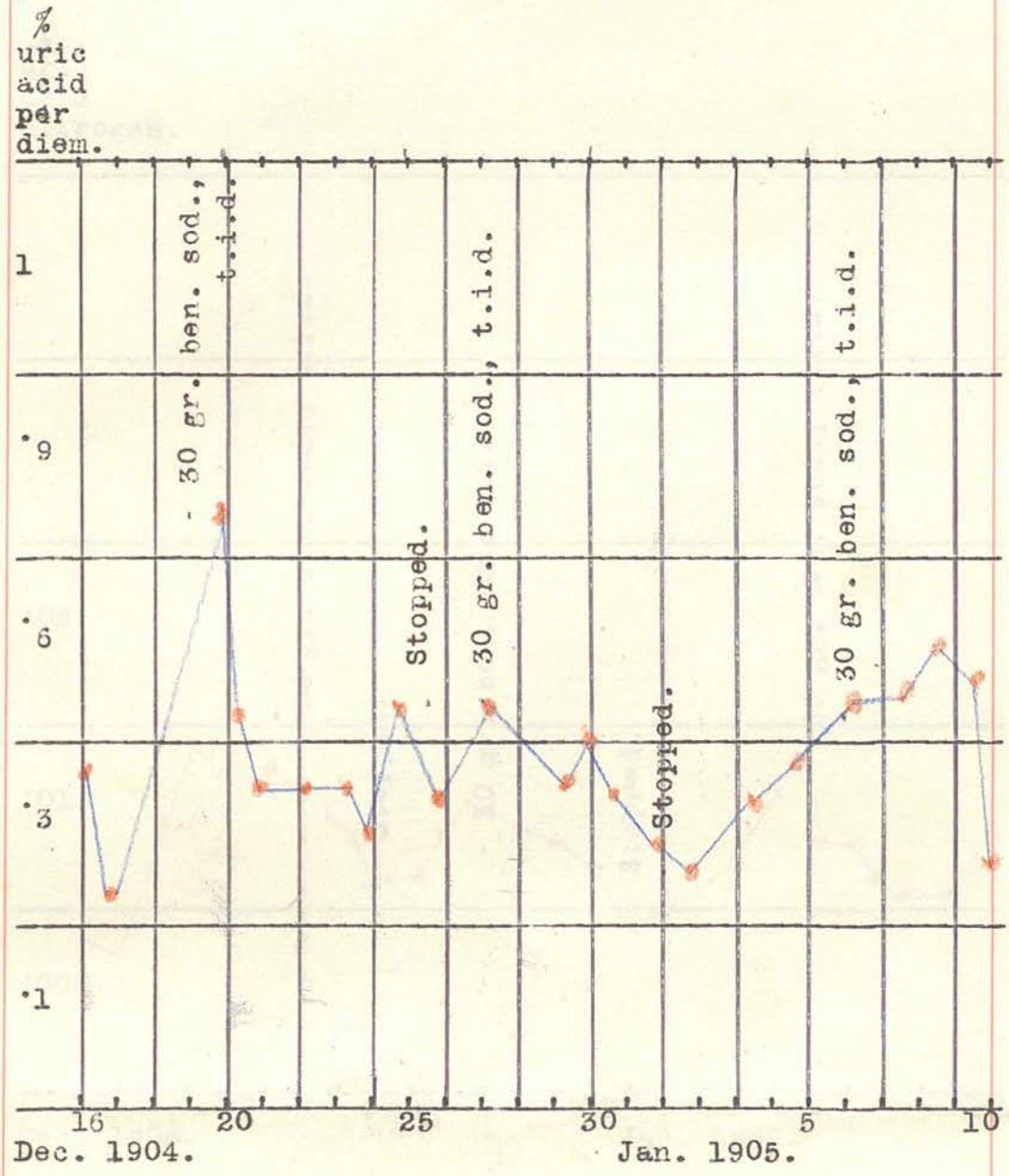
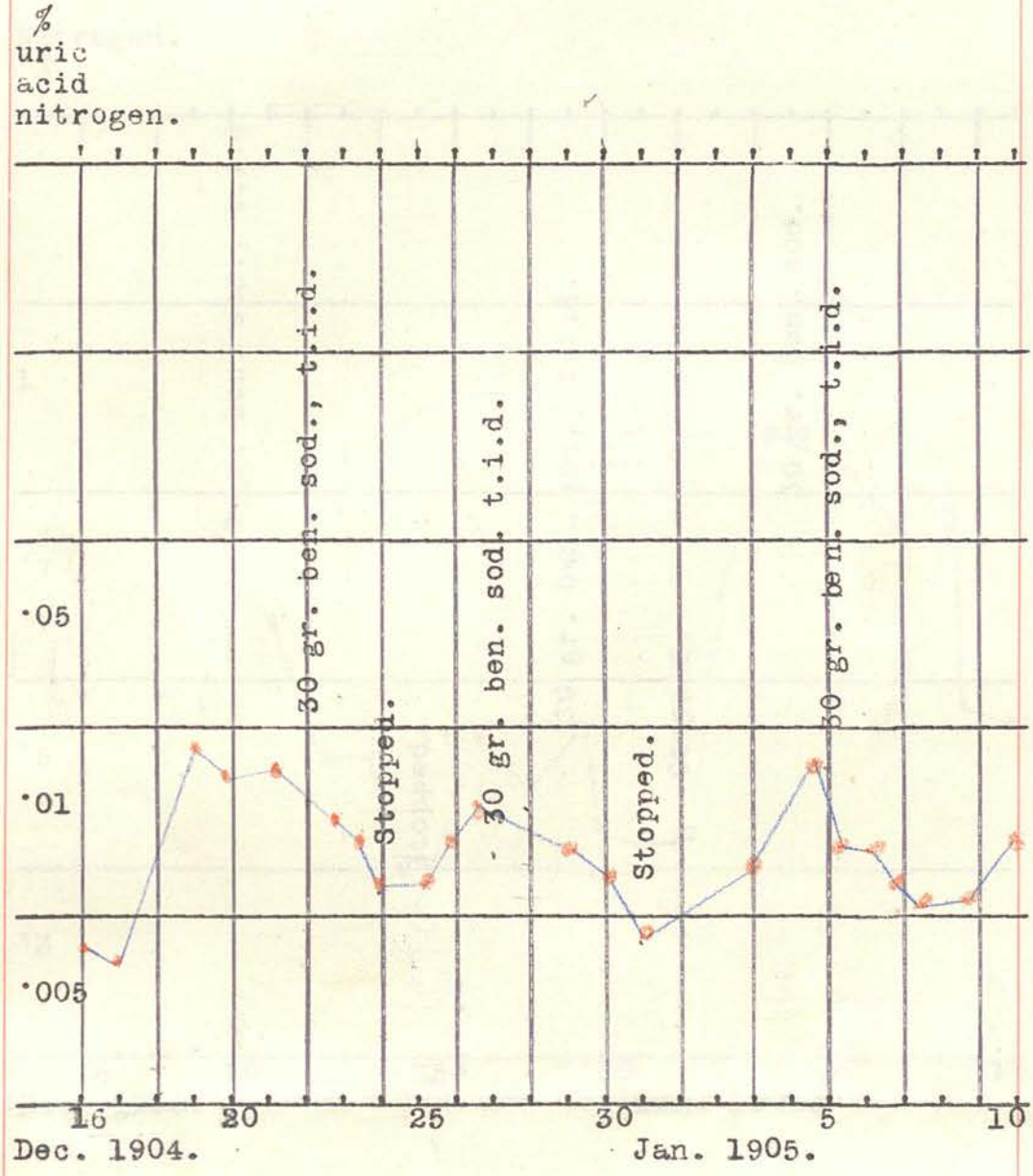



Fig. /

FIG. XI.

James Brown.--Chart of uric acid and nitrogen showing reduction of nitrogen under benzoate of soda,--30 gr. thrice daily.




Urine of 18th and 28th Dec. 1904 and 2nd Jan. 1905 not kept at Royal Infirmary.

Fig. /

FIG. XII.

James Brown.--Chart showing a rise of nitrogen in the daily excretion under the influence of benzoate of soda,--30 gr. thrice daily.

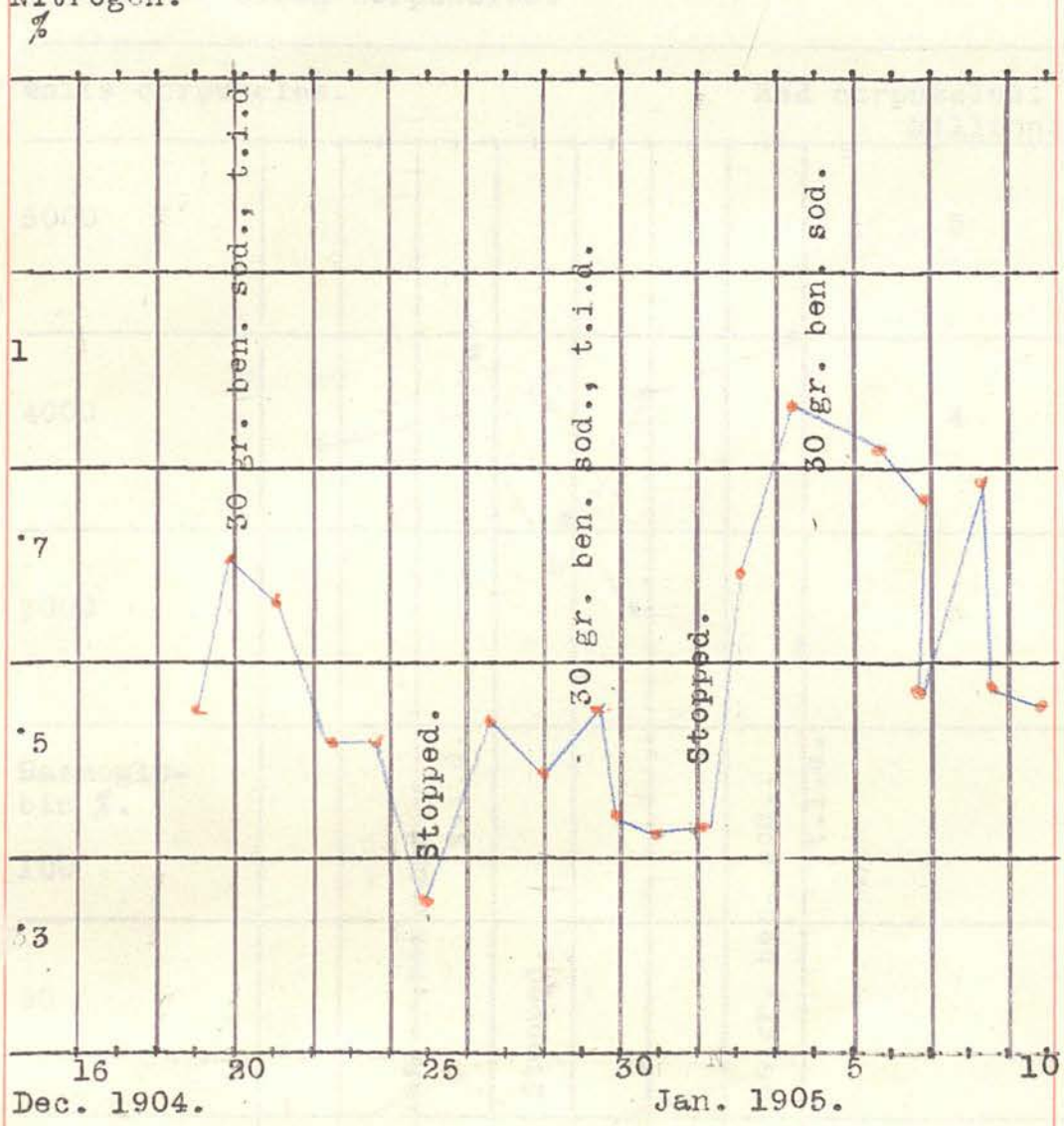



Fig. /

FIG. XIII.

James Brown.--Chart showing the effect on the blood.

Red--Haemoglobin. Blue--White blood corpuscles.

Brown--Red blood corpuscles.

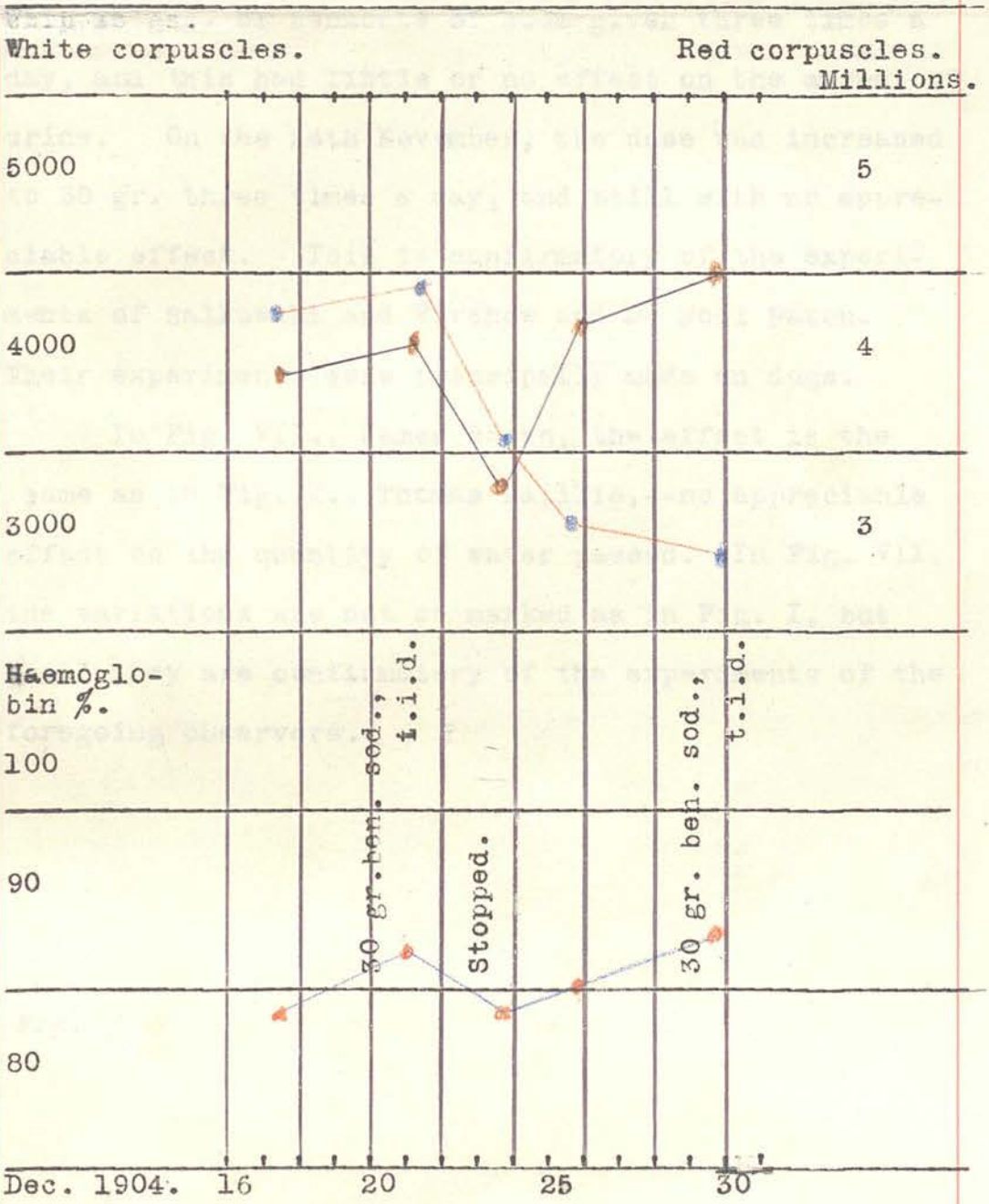



Fig. /

FIG. I. AND VII.

These charts show the effect of benzoate of soda on amount of water. It will be noticed that while there are variations in the amounts, the benzoate of soda has no marked influence in regard to the quantity of water passed in the twenty-four hours. We started with 15 grs. of benzoate of soda given three times a day, and this had little or no effect on the amount of urine. On the 24th November, the dose was increased to 30 gr. three times a day, and still with no appreciable effect. This is confirmatory of the experiments of Salkowski and Virchow and Dr Noël Paton. Their experiments were principally made on dogs.

In Fig. VII., James Brown, the effect is the same as in Fig. I., Thomas Baillie,--no appreciable effect on the quantity of water passed. In Fig. VII. the variations are not so marked as in Fig. I, but still they are confirmatory of the experiments of the foregoing observers.

Fig. /

## FIG. II. AND VIII.

These charts show the effect of benzoate of soda as indicated by the reducing effect upon permanganate of potassium. In Fig. II.,Thomas Baillie, there is a very marked effect upon the reducing effect produced. For example, on the 15th we have 46 c.c. of permanganate of potassium, and on the 17th 22 c.c.,--a marked reduction. Again, when benzoate of soda was stopped on the 22nd November, it rises to 14 c.c. on the 23rd, and then it drops to 7 when benzoate of soda was given. All through the chart there is shown a marked reduction on the reducing effect of permanganate of potassium.

In Fig. VIII., James Brown, we have the same thing brought out, although not in so ~~gxeax~~ marked a degree. On the 18th December, 30 gr. of benzoate of soda was given, and there was a steady reduction until the 24th, when benzoate of soda was stopped; and then we have a rise on the 28th. Again, on the 28th, 30 gr. was repeated, with the result of a steady fall to the 1st January. Benzoate of soda was stopped on the 2nd January, and immediately there was a rise up to the 4th. All this bears out what was noticed in Fig. II.

Fig. /

## FIG. III. AND IX.

These charts show in percentage the effect of benzoate of soda on the excretion of uric acid.

Fig. III., Thomas Baillie, exhibits a marked reduction on the amount of uric acid passed in the twenty-four hours. For example, on the 15th November the percentage of uric acid stood at 0·172; 15 gr. of benzoate of soda was given, and with this small dose the uric acid was reduced to 0·045% on the 17th. The benzoate of soda was stopped on the 22nd, and at once a rise took place to ·04. On this date, 30 gr. of benzoate of soda was given. Again a reduction to ·01 on the 24th. On the 29th, benzoate of soda was again stopped, and again a rise to ·07.

In Fig. IX., James Brown, I got here not a similar state of affairs, although perhaps in so decided a degree. In this chart, 30 gr. of benzoate of soda was given all through. On the 31st December, benzoate of soda was stopped, when it immediately rose from ·01 to ·07 on the 5th January.

These charts confirm the experiments of Salkowski, Virchow, and Dr Noel Paton as to the reduction of uric acid under benzoate of soda.

Fig. /

## FIG. IV. AND X.

These two charts deal with the amount of uric acid per diem under benzoate acid, first given in 15 and then in 30 gr. three times a day.

In order to make the results of the experiments more apparent, I next found by calculation the amount of uric acid per diem, so as to give a true result over the twenty-four hours, and not for a limited time. In the case of Garrod's experiments, the urine of twenty-four hours was not dealt with, nor the diet in any way fixed. (Brit. Med. Journal, 1883, vol. i.) In his experiments, the urine was collected from 11 a.m. to 2 p.m. after 60 gr. of benzoate of soda was given. In his second experiment, the urine was again collected only from 11 a.m. to 2 p. m.

In Fig. IV., Thomas Baillie, on the 15th the percentage was 1. Then 15 gr. of benzoate of soda was given three times a day, and immediately there was a steady fall to the 20th to ·1%. The medicine was stopped on the 22nd, and there was a rise, and of course that is what one would naturally expect after examination of charts of the percentage of uric acid.

The same facts are borne out by an examination of Fig. X., James Brown.

Fig. /

FIG. V. AND XI.

These charts show the reduction of percentage of nitrogen under the influence of benzoate of soda. uric acid

In the case of Thomas Baillie, Fig. V., on the 15th the nitrogen stood at ·06; 15 gr. of benzoate of soda was given, and there was a drop to the 22nd of ·005. Then 30 gr. of benzoate of soda was given, and the nitrogen rose to ·01.

This is not so well brought out in the chart of James Brown, Fig. XI., but there is sufficient evidence in it to confirm the chart of Thomas Baillie in its general tone, showing the reduction of nitrogen under benzoate of soda.

It will be noticed in the chart of James Brown no notes are taken of the analyses of the urine on the 18th December and 28th December 1904 and of the 2nd January 1905; the urine on these dates were not kept, by some mistake, at the Royal Infirmary.

FIG. XII.

This chart, James Brown, (we have no corresponding chart in the case of Thomas Baillie), treats of the percentage of nitrogen brought out by Kjedalh's method,--a method which has been briefly sketched at an earlier stage.

This experiment was only undertaken some days after the analysis of the urine of James Brown, was begun and was made as a confirmatory test of the experiments of Salkowski, Virchow, and Dr Noel Paton.

The chart brings out the great reduction during the twenty-four hours.

Fig. /

## FIG. VI. AND XIII.

These charts show the effect on the blood as regards Haemoglobin, the red and the white corpuscles.

All these experiments were principally to find out the effect on uric acid under benzoate soda. I took a series of blood tests by the Toma Zeiss counter immediately before the benzoate was given and immediately after it was stopped. I also prepared several films, but these need not call for any special attention here.

In the case of Thomas Baillie, Fig. VI., I took a blood count on the 16th November, and the red blood corpuscles were 1,850,000. This appeared to me extremely low, and I verified it by taking another count. I may mention that the patient was very anaemic, having been without proper food or shelter for some time prior to his admission to the hospital. The haemoglobinometer registered only 78% of haemoglobin. The white corpuscles were 4200. After he had been under the benzoate of soda for a week, another blood count was taken. This time the red blood corpuscles amounted to 1,950,000, and the white corpuscles to 3400, and the haemoglobin to 80%. At the end of the second /

second week, another blood count was taken, showing red corpuscles 4,080,000, white 4400, and haemoglobin 90%. The patient's general condition was very much improved. I have not entered many of the blood counts in order to prevent confusion.

Baillie increased rapidly in weight, from 5 st. 13 lb. on admission to 7 st. 0¾ lb. on leaving. His general condition was much improved, as also his muscular tone and general development.

In the case of James Brown, Fig. XIII., there was not such a marked effect, as he had been comfortably housed and well fed. On the 16th December, haemoglobin was 78%, and on the 20th 85%, and on the 30th it was 90% The white corpuscles on admission were 4500, and fell to 3000. On admission the red corpuscles were 3,000,000, and rose to 5,000,000.

Fehling /

Fehling's Reaction.

Regarding the column headed "Fehling Reaction," in this I was most particular to do a check test on the daily urine, as it has been pointed out by Salkowski, Virchow, and Dr Noel Paton that in many cases there was a decided reaction with Fehling's solution which led these observers to conclude that the administration of benzoate of soda had in some way or other an alteration or production in sugar in the urine.

In Thomas Baillie's urine on the 20th November there was a slight reaction on Fehling's solution. Again, in the same patient's urine on the 28th November, there was a decided reaction in Fehling's solution. But in all the other dates, both in the case of Baillie and Brown, I failed to get any reaction, and I guardedly and scrupulously eliminated all sources of error that would tend towards the reaction. In these particular cases they certainly appeared to be contrary to the experiments of the above observers.

Medicines /

Medicines.

In the column on medicines, attention may be called to the extremely small dose used in comparison to those given to dogs by other experimenters.

Another element entered into the experiments,--namely, that at the Royal Infirmary there is a reluctance to push benzoate of soda too much as their therapeutic information was not extensive, so that we started with 15 gr. three times a day. The small dose had the advantage of making the experiments more sensitive. Afterwards, the Resident found that with all security he could double the dose at my request. As has already been remarked, the patient had already been put under Tinct. Card. Co. during the intermission of benzoate of soda from a palliative point of view.

In the case of James Brown, Quin.Salicyl. was ordered on December 14, but as a matter of fact the patient was never under it. On the 15th December Tinct. Card. Co. was given, and on a nitrogenous balance being established 30 gr. benzoate of soda was started on the 21st December, which was continued all through this case, with intermissions of four days.

Conclusions. /

Conclusions.

The foregoing experiments mainly confirm the observations of Salkowski, Virchow, and Dr Noël Paton as to the action of benzoate of soda on the urine. As I formerly pointed out, however, these experiments laboured under the disadvantage of being wholly made on dogs. Garrod, it is true, carried forward these observations to man, but even in his case there was a limiting element. He only on two occasions collected urine, and then only for three hours on each day, between 11 a.m. and 2 p.m. It must also be pointed out that Garrod made no control of the diet as to its nature, amount, or quantity.

Whatever value may be attached to my experiments, there can at least this be said for them,--that the urine on which the analyses were made was collected for the whole of the twenty-four hours, and day by day continuously for a period of over two months in the first case and for about six weeks in the second. By this extended series of experiments over two long periods, and under known and fixed diet, I was /

was able to eliminate sources of error and give a larger basis for my conclusions.

The broad result I obtained is, the benzoate of soda has little or no influence on the amount of urine passed in the twenty-four hours; and I was glad to find, after having ended my experiments, that this fact, along with others that I have brought out, confirms what has been noticed by others.

I think this proves that no mere mechanical action in the way of the quantity of water excreted tended in any degree to influence the results.

Also, this conclusion is clear, that the uric acid excretion in the twenty-four hours has certainly diminished.

Further, it is shown that there is a daily rise in the excretion of nitrogen.

Unfortunately, the nitrogen analyses were not estimated until a late stage in my experiments, and then only as a confirmatory test of the uric acid results. So far as I went, however, the tables and charts bear out the result I have stated.

Regarding /

Regarding the Fehling reaction, many observers have noticed that there is a reduction, which led them to suppose that sugar was excreted or formed by means of the benzoate of soda. I bore this fact in mind, but, after daily tests, I failed to arrive at the same conclusion, as only on two occasions did I get a very faint reduction, and that only in the first experiment. In the second experiment, there was nothing that would lead one to suppose that there was even a slight reduction. This is a point worth noticing in the administration of benzoate of soda.

To the physician, these experiments must be of considerable interest, in confirming the basis or key to the therapeutic action of benzoate of soda in such diseases as gout, rheumatism, diptheria, bronchial catarrh, malarial fever, acute rheumatism, whooping-cough, and febrile diseases, and in those cases where quinine and sulphate of sodium may be used.

They also confirm the facts brought out by Dr Klebs of Prague of their antiseptic value, and that we can boldly push much larger doses of benzoate of soda than we are in the habit of doing and get a beneficial effect.

I /

I have to thank Dr Smart for placing the patients in his wards in the Royal Infirmary at my disposal; and the Laboratory Committee for granting me permission to use the Physicians' Laboratory.

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